

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>				1. CONTRACT ID CODE		PAGE 1 OF 3 PAGES	
2. AMENDMENT/MODIFICATION NO. 0002		3. EFFECTIVE DATE 7/25/03		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. (If applicable)	
6. ISSUED BY  U.S. Army Corps of Engineers Honolulu Engineer District Construction/A-E Contract Branch Building 200 Fort Shafter, Hawaii 96858-5440		CODE		7. ADMINISTERED BY (If other than Item 6)  U.S. Army Corps of Engineers Honolulu Engineer District Schofield Resident Office Building 230 Fort Shafter, Hawaii 96858-5440		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)				(✓)		9A. AMENDMENT OF SOLICITATION NO. DACA83-03-R-0013	
				×		9B. DATED (SEE ITEM 11) 7/3/03	
				10A. MODIFICATION OF CONTRACTS/ORDER NO.		10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE					

**11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS**

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning \_\_\_\_\_ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

**13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.**

(✓)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER (Specify type of modification and authority)

**E. IMPORTANT:** Contractor ☐ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

FY03 MCA/BUP PN 52068/69, Whole Barracks Renewal Brigade Complex, Phase 3A, Quad C, Schofield Barracks, Oahu, Hawaii

(See pages 2 and 3 of 3 pages)

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)	
15B. CONTRACTOR/OFFEROR  _____ (Signature of person authorized to sign)		16B. UNITED STATES OF AMERICA  BY _____ (Signature of Contracting Officer)	
15C. DATE SIGNED		16C. DATE SIGNED	

AM-0002  
No. DACA83-03-R-0013  
Item 14 (Continued)

Standard Form 30  
Page 2 of 3 Pages

1. CHANGES TO SPECIFICATIONS. Attached hereto are new and revised pages and sections to the specifications. The revision mark "(AM-0002)" is shown on each new and revised page.

A. REVISIONS. The following information is revised in the specifications. Changes are indicated in bold.

Section 00010, Proposal Schedule, Item No. 5, payment e.  
Section 00100, 52.236-27 "Site Visit (Construction) (Feb 1995 - Alternate I (Feb 1995)"  
Section 00120, paragraphs 2.2, 2.4, 2.5.1,  
Section 01900, paragraph 1.12.1.2  
Statement of Work  
Chapter 5 paragraph 5-1.2.4 and 5-7.2.4  
Chapter 6 paragraph 6-5.5, 6-6.6, 6-5.8 and Existing Timber  
Roof Framing photos  
Chapter 12 paragraph 12-13.5  
Chapter 15, paragraph 15-11  
Attachment Table of Contents, page 2

B. ADDITIONS. The following information specification:

Section 00100 S-36.38 "Cost Limitation - Target Ceiling - June 1999"  
Section 00120 pages 1 to 19  
Section 00900 Responses to Contractor Questions/Site Visit and Preproposal  
Conference Information  
Section 01012 pages 1 to 2  
Statement of Work Table of Contents pages 1 to 7  
Statement of Work, Chapter 2 pages 1 to 62  
Statement of Work, Chapter 3 pages 1 to 22  
Attachment 10  
Attachment 13 SpiRiT checklist  
Attachment 29  
Attachment 30  
Attachment 31

C. DELETIONS. The following pages are deleted from the specifications:

Section 00120 pages 1 to 20  
Section 01012 pages 1 to 4  
Statement of Work Table of Contents pages 1 to 9  
4 Statement of Work, Chapter 2 pages 1 to 61  
Statement of Work, Chapter 3 pages 1 to 6  
Statement of Work, Chapter 4 pages 1 to 17  
Attachment Table of Contents, page 2  
Attachment 10

AM-0002  
No. DACA83-03-R-0013  
Item 14 (Continued)

Standard Form 30  
Page 3 of 3 Pages

2. CHANGES TO DRAWINGS. The following revised drawings replace like-numbered drawings and are issued herewith:

Whole Barracks Renewal Brigade Complex  
QUAD C (RFP Concept Design)

REV	<u>RING NO.</u>	<u>DRAWING NO.</u>	<u>SHEET NO.</u>	<u>LTR</u>	<u>REVISION DATE</u>
1		721-11-28	T-1	a	7/17/03
4		721-11-28	A-1.1	a	7/17/03
23		721-11-28	M-1	a	7/17/03

3. The cut-off date for submission of questions/clarifications pertaining to this solicitation is July 31, 2003.

4. The proposal due date of August 11, 2003, 2:00 p.m. Hawaiian Standard Time (HST), remains unchanged.

SECTION 00010  
PROPOSAL SCHEDULE

FY03 MCA/BUP PN52068/52069, WBR Brigade Complex, Ph 3A (Quad C)  
Schofield Barracks

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	AMOUNT
Base Schedule:				
1.	Design Work			
	a. MCA Funded	1	Job	\$_____
	b. BUP Funded	1	Job	\$_____
	Total Bid Item No. 1			\$_____
2.	Construction Work			
	a. MCA Funded	1	Job	\$_____
	b. BUP Funded	1	Job	\$_____
	Total Bid Item No. 2			\$_____
	Total Base Schedule			\$_____
Options:				
3.	Work to Increase SDD Rating from Silver to Gold (Option No. 1)			
	a. MCA Work	1	Job	\$_____
	b. BUP Work	1	Job	\$_____
	Total Option No. 1			\$_____
4.	Cook Tops (Option No. 2)			
	a. MCA Work	1	Job	\$_____
	b. BUP Work	1	Job	\$_____
	Total Option No. 2			\$_____
5.	<b>AT/FP Floor Slab Reinforcement (Option 3)</b>			
	<b>a. MCA Work</b>	<b>1</b>	<b>Job</b>	<b>\$_____</b>
	<b>b. BUP Work</b>	<b>1</b>	<b>Job</b>	<b>\$_____</b>
	Total Base Schedule plus Option Items			\$_____

THE FOLLOWING WILL BE COMPLETED BY THE CONTRACTING OFFICER UPON AWARD:

TOTAL AWARD AMOUNT (Base Schedule plus Options Nos. \_\_\_\_\_) \$\_\_\_\_\_



NOTES:

1. MCA Work and BUP work for this proposal schedule are as follows:

MCA Work

Bldg. 355, 2<sup>nd</sup> and 3<sup>rd</sup> Floors  
Bldg. 356, 1<sup>st</sup> Floor  
Bldg. 357, 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> Floors  
Bldg. 358, 1<sup>st</sup> Floor  
Site and Utility Work  
Fire Pump Building  
Gear Wash Building

BUP Work

Bldg. 355, 1<sup>st</sup> Floor  
Bldg. 356, 2<sup>nd</sup> and 3<sup>rd</sup> Floors  
Bldg. 358, 2<sup>nd</sup> and 3<sup>rd</sup> Floors  
Built-up Roofing on Existing Buildings  
Temporary Utilities for Building 355  
Cooling Tower

2a. As consideration for the Government's evaluation of the Offeror's proposal, Offeror agrees, should it be awarded a contract under this solicitation, that all specifically-named proposed employees, joint venture partners, subcontractors, team members, or other specifically named legal relationships, identified in the Offeror's proposal—at any tier at or below the prime contractor and its subcontractors, joint venture partners or team members— shall be utilized, as proposed, under the contract.

b. The Offeror further agrees that it shall not substitute after award a party for any specifically-named proposed employee, proposed joint venture partners, subcontractors, team members, or other specifically named relationships, identified in the Offeror's proposal—at any tier at or below the prime contractor and its subcontractors, joint venture partners or team members—without prior application to, and approval from, the Contracting Officer.

c. The Contracting Officer may in his or her sole discretion approve substitution after award upon determination that such substitution is made in good faith by the contractor; it is for good cause; and it is in the Government's interest to allow the substitution. The contractor shall include in its submission for proposed substitution such information as may be necessary to reasonably establish the three conditions set forth above; and at a minimum it shall include, information that the proposed substitute employee, proposed joint venture partner, subcontractor team member, or other specifically named substitute legal relationship, is as or better experienced or qualified than the originally proposed employee, joint venture partner, subcontractor team member, or other specifically named relationship. The Contracting Officer may require such additional information from the contractor as is necessary to make a determination in the matter.

d. The Offeror further agrees that the Contracting Officer's approval of any substitution shall be at no cost to the Government, provided such substitution does not involve a change to the scope of work under the contract. The Offeror further agrees that it shall hold harmless and indemnify the Government, its lawful agents, employees and officers from any liability that may arise from the act of the Contracting Officer permitting the contractor to substitute for the originally proposed employee, joint venture partner, subcontractor team member, or other specifically named legal relationship.

e. The Offeror agrees that it shall, as contractor, insert in all subcontracts, joint venture agreements, teaming agreements, or other legal relationships provisions substantially similar to this, and shall require its subcontractors, joint venture partners, team members and other parties with whom it has a legal relationship to do the same.

3. By submission of an offer under the OPTION, Offeror agrees that the Government may exercise the OPTION at the time of award, or at any time within 30 days following the date of the award of the basic contract. (See Provision No. 52.217-5, EVALUATION OF OPTIONS, in Section 00100).

4. Failure to bid on all the items in the Proposal Schedule may cause the bid to be considered nonresponsive.

#### PAYMENT(S)

Compensation for all work to be performed under this contract will be made under the payment item(s) listed herein. Price(s) and payment(s) for the item(s) shall cover all work, complete and finished in accordance with the specifications, schedules, and drawings, and shall be full compensation for all work in connection therewith, including quality control and cost of performance-and payment-bond premiums as specified in the CONTRACT CLAUSES. Price(s) and payment(s) shall constitute full and final compensation for furnishing all materials, equipment, management, supervision, labor, transportation, fuel, power, water, and all incidental items necessary to complete the work, except as otherwise specified to be furnished by the Government. For the purpose of CONTRACT CLAUSE entitled "PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS", the term "designated billing office" and "designated payment office" are as follows:

a. Billing Office  
U.S. Army Engineer District, Honolulu  
Schofield Barracks Resident Office, Bldg. 230  
Fort Shafter, HI 96858-5440

b. Payment Office  
USACE Finance Center  
Attn: CEFC-FP  
5722 Integrity Drive  
Millington, TN 38054-5005

Item numbers mentioned herein after correspond to the item numbers in the PROPOSAL SCHEDULE.

a. Item Nos. 1a and 1b, Design Work, will be paid for at the contract price, to include design for, site preparation, building, waterlines, sanitary-sewer system, storm-drainage system, pavement, concrete sidewalks, curbs, and gutters, landscaping, mechanical work, electrical work, and all incidental items necessary to complete the work.

b. Item Nos. 2a and 2b, Construction Work, will be paid for at the contract price, complete in place and ready for use, including site preparation, building, waterlines, sanitary-sewer system, storm-drainage system, pavement, concrete sidewalks, curbs, and gutters, establishment of turf, mechanical work, electrical work, testing, final connections, cleanup, and all incidental items necessary to complete the work.

c. Item No. 3a and 3b, Work to increase SDD Rating from Silver to Gold (Option No. 1), will be paid for at the contract price including design and construction, and all incidental items necessary to complete the work.

d. Item Nos. 4a and 4b, Cook Tops (Option No. 2), will be paid for at the contract price complete in place and ready for use, including exhaust hoods, ductwork, garbage disposer, electric circuits, and all other incidental items necessary to complete the work.

**e. Item No. 5, (Option 3), will be paid for at the contract price complete in place and ready for use, including design, construction and all other incidental items necessary to complete the work.**

-- End of Section --

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SECTION 00100 Instructions, Conditions, and Notices to Bidders

CLAUSES INCORPORATED BY FULL TEXT

52.204-6 DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER (JUN 99)

(a) Contractor identification is essential for complying with statutory contract reporting requirements. Therefore, the offeror is requested to enter, in the block with its name and address on the Standard Form 33 or similar document, the annotation "DUNS" followed by the DUNS number which identifies the offeror's name and address exactly as stated in the offer.

(b) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one. A DUNS number will be provided immediately by telephone at no charge to the offeror. For information on obtaining a DUNS number, the offeror, if located within the United States, should call Dun and Bradstreet at 1-800-333-0505. The offeror should be prepared to provide the following information:

- (1) Company name.
- (2) Company address.
- (3) Company telephone number.
- (4) Line of business.
- (5) Chief executive officer/key manager.
- (6) Date the company was started.
- (7) Number of people employed by the company.
- (8) Company affiliation.

(c) Offerors located outside the United States may obtain the location and phone number of the local Dun and Bradstreet Information Services office from the Internet Home Page at <http://www.customerservice@dnb.com/>. If an offeror is unable to locate a local service center, it may send an e-mail to Dun and Bradstreet at [globalinfo@dnb.com](mailto:globalinfo@dnb.com).

(End of provision)

52.211-2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE DOD INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) AND DESCRIPTIONS LISTED IN THE ACQUISITION MANAGEMENT SYSTEMS AND DATA REQUIREMENTS CONTROL LIST, DOD 5010.12-L (DEC 1999)

Copies of specifications, standards, and data item descriptions cited in this solicitation may be obtained--

- (a) From the ASSIST database via the Internet at <http://assist.daps.mil>; or

(b) By submitting a request to the--Department of Defense Single Stock Point (DoDSSP), Building 4, Section D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Telephone (215) 697-2667/2179, Facsimile (215) 697-1462.

(End of provision)

#### 52.211-14 NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE (SEP 1990)

Any contract awarded as a result of this solicitation will be ☐ DX rated order; ☒ DO rated order certified for national defense use under the Defense Priorities and Allocations System (DPAS) (15 CFR 700), and the Contractor will be required to follow all of the requirements of this regulation. [Contracting Officer check appropriate box.]

(End of provision)

#### 52.215-1 INSTRUCTIONS TO OFFERORS--COMPETITIVE ACQUISITION (MAY 2001)

(a) Definitions. As used in this provision--

"Discussions" are negotiations that occur after establishment of the competitive range that may, at the Contracting Officer's discretion, result in the offeror being allowed to revise its proposal.

In writing, writing, or written means any worded or numbered expression that can be read, reproduced, and later communicated, and includes electronically transmitted and stored information.

"Proposal modification" is a change made to a proposal before the solicitation's closing date and time, or made in response to an amendment, or made to correct a mistake at any time before award.

"Proposal revision" is a change to a proposal made after the solicitation closing date, at the request of or as allowed by a Contracting Officer as the result of negotiations.

"Time", if stated as a number of days, is calculated using calendar days, unless otherwise specified, and will include Saturdays, Sundays, and legal holidays. However, if the last day falls on a Saturday, Sunday, or legal holiday, then the period shall include the next working day.

(b) Amendments to solicitations. If this solicitation is amended, all terms and conditions that are not amended remain unchanged. Offerors shall acknowledge receipt of any amendment to this solicitation by the date and time specified in the amendment(s).

(c) Submission, modification, revision, and withdrawal of proposals. (1) Unless other methods (e.g., electronic commerce or facsimile) are permitted in the solicitation, proposals and modifications to proposals shall be submitted in paper media in sealed envelopes or packages (i) addressed to the office specified in the solicitation, and (ii) showing the time and date specified for receipt, the solicitation number, and the name and address of the offeror. Offerors using commercial carriers should ensure that the proposal is marked on the outermost wrapper with the information in paragraphs (c)(1)(i) and (c)(1)(ii) of this provision.

(2) The first page of the proposal must show--

(i) The solicitation number;

(ii) The name, address, and telephone and facsimile numbers of the offeror (and electronic

address if available);

(iii) A statement specifying the extent of agreement with all terms, conditions, and provisions included in the solicitation and agreement to furnish any or all items upon which prices are offered at the price set opposite each item;

(iv) Names, titles, and telephone and facsimile numbers (and electronic addresses if available) of persons authorized to negotiate on the offeror's behalf with the Government in connection with this solicitation; and

(v) Name, title, and signature of person authorized to sign the proposal. Proposals signed by an agent shall be accompanied by evidence of that agent's authority, unless that evidence has been previously furnished to the issuing office.

(3) Submission, modification, or revision, of proposals.

(i) Offerors are responsible for submitting proposals, and any modifications, or revisions, so as to reach the Government office designated in the solicitation by the time specified in the solicitation. If no time is specified in the solicitation, the time for receipt is 4:30 p.m., local time, for the designated Government office on the date that proposal or revision is due.

(ii)(A) Any proposal, modification, or revision received at the Government office designated in the solicitation after the exact time specified for receipt of offers is "late" and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late offer would not unduly delay the acquisition; and--

(1) If it was transmitted through an electronic commerce method authorized by the solicitation, it was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of proposals; or

(2) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of offers and was under the Government's control prior to the time set for receipt of offers; or

(3) It is the only proposal received.

(B) However, a late modification of an otherwise successful proposal that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.

(iii) Acceptable evidence to establish the time of receipt at the Government installation includes the time/date stamp of that installation on the proposal wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

(iv) If an emergency or unanticipated event interrupts normal Government processes so that proposals cannot be received at the office designated for receipt of proposals by the exact time specified in the solicitation, and urgent Government requirements preclude amendment of the solicitation, the time specified for receipt of proposals will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.

(v) Proposals may be withdrawn by written notice received at any time before award. Oral proposals in response to oral solicitations may be withdrawn orally. If the solicitation authorizes facsimile proposals, proposals may be withdrawn via facsimile received at any time before award, subject to the conditions specified in the provision at 52.215-5, Facsimile Proposals. Proposals may be withdrawn in person by an offeror or an authorized representative, if the identity of the

person requesting withdrawal is established and the person signs a receipt for the proposal before award.

(4) Unless otherwise specified in the solicitation, the offeror may propose to provide any item or combination of items.

(5) Offerors shall submit proposals in response to this solicitation in English, unless otherwise permitted by the solicitation, and in U.S. dollars, unless the provision at FAR 52.225-17, Evaluation of Foreign Currency Offers, is included in the solicitation.

(6) Offerors may submit modifications to their proposals at any time before the solicitation closing date and time, and may submit modifications in response to an amendment, or to correct a mistake at any time before award.

(7) Offerors may submit revised proposals only if requested or allowed by the Contracting Officer.

(8) Proposals may be withdrawn at any time before award. Withdrawals are effective upon receipt of notice by the Contracting Officer.

(d) Offer expiration date. Proposals in response to this solicitation will be valid for the number of days specified on the solicitation cover sheet (unless a different period is proposed by the offeror).

(e) Restriction on disclosure and use of data. Offerors that include in their proposals data that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, shall--

(1) Mark the title page with the following legend: This proposal includes data that shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed--in whole or in part--for any purpose other than to evaluate this proposal. If, however, a contract is awarded to this offeror as a result of--or in connection with-- the submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting contract. This restriction does not limit the Government's right to use information contained in this data if it is obtained from another source without restriction. The data subject to this restriction are contained in sheets [insert numbers or other identification of sheets]; and

(2) Mark each sheet of data it wishes to restrict with the following legend: Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal.

(f) Contract award. (1) The Government intends to award a contract or contracts resulting from this solicitation to the responsible offeror(s) whose proposal(s) represents the best value after evaluation in accordance with the factors and subfactors in the solicitation.

(2) The Government may reject any or all proposals if such action is in the Government's interest.

(3) The Government may waive informalities and minor irregularities in proposals received.

(4) The Government intends to evaluate proposals and award a contract without discussions with offerors (except clarifications as described in FAR 15.306(a)). Therefore, the offeror's initial proposal should contain the offeror's best terms from a cost or price and technical standpoint. The Government reserves the right to conduct discussions if the Contracting Officer later determines them to be necessary. If the Contracting Officer determines that the number of proposals that would otherwise be in the competitive range exceeds the number at which an efficient competition can be conducted, the Contracting Officer may limit the number of proposals in the competitive range to the greatest number that will permit an efficient competition among the most highly rated proposals.

(5) The Government reserves the right to make an award on any item for a quantity less than the quantity offered, at the unit cost or prices offered, unless the offeror specifies otherwise in the proposal.

(6) The Government reserves the right to make multiple awards if, after considering the additional administrative costs, it is in the Government's best interest to do so.

(7) Exchanges with offerors after receipt of a proposal do not constitute a rejection or counteroffer by the Government.

(8) The Government may determine that a proposal is unacceptable if the prices proposed are materially unbalanced between line items or subline items. Unbalanced pricing exists when, despite an acceptable total evaluated price, the price of one or more contract line items is significantly overstated or understated as indicated by the application of cost or price analysis techniques. A proposal may be rejected if the Contracting Officer determines that the lack of balance poses an unacceptable risk to the Government.

(9) If a cost realism analysis is performed, cost realism may be considered by the source selection authority in evaluating performance or schedule risk.

(10) A written award or acceptance of proposal mailed or otherwise furnished to the successful offeror within the time specified in the proposal shall result in a binding contract without further action by either party.

(11) The Government may disclose the following information in postaward debriefings to other offerors:

(i) The overall evaluated cost or price and technical rating of the successful offeror;

(ii) The overall ranking of all offerors, when any ranking was developed by the agency during source selection;

(iii) A summary of the rationale for award; and

(iv) For acquisitions of commercial items, the make and model of the item to be delivered by the successful offeror.

(End of provision)

#### 52.215-16 FACILITIES CAPITAL COST OF MONEY (OCT 1997)

(a) Facilities capital cost of money will be an allowable cost under the contemplated contract, if the criteria for allowability in subparagraph 31.205-10(a)(2) of the Federal Acquisition Regulation are met. One of the allowability criteria requires the prospective contractor to propose facilities capital cost of money in its offer.

(b) If the prospective Contractor does not propose this cost, the resulting contract will include the clause Waiver of Facilities Capital Cost of Money.

(End of provision)

#### 52.216-1 TYPE OF CONTRACT (APR 1984)



The Government contemplates award of a firm fixed price contract resulting from this solicitation.

(End of clause)

#### 52.217-5 EVALUATION OF OPTIONS (JUL 1990)

Except when it is determined in accordance with FAR 17.206(b) not to be in the Government's best interests, the Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirement. Evaluation of options will not obligate the Government to exercise the option(s).

(End of Provision)

#### 52.219-24 SMALL DISADVANTAGED BUSINESS PARTICIPATION PROGRAM--TARGETS (OCT 2000)

(a) This solicitation contains a source selection factor or subfactor related to the participation of small disadvantaged business (SDB) concerns in the contract. Credit under that evaluation factor or subfactor is not available to an SDB concern that qualifies for a price evaluation adjustment under the clause at FAR 52.219-23, Notice of Price Evaluation Adjustment for Small Disadvantaged Business Concerns, unless the SDB concern specifically waives the price evaluation adjustment.

(b) In order to receive credit under the source selection factor or subfactor, the offeror must provide, with its offer, targets, expressed as dollars and percentages of total contract value, for SDB participation in any of the North American Industry Classification System (NAICS Industry Subsectors as determined by the Department of Commerce. The targets may provide for participation by a prime contractor, joint venture partner, teaming arrangement member, or subcontractor; however, the targets for subcontractors must be listed separately.

(End of provision)

#### 52.222-23 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY FOR CONSTRUCTION (FEB 1999)

(a) The offeror's attention is called to the Equal Opportunity clause and the Affirmative Action Compliance Requirements for Construction clause of this solicitation.

(b) The goals for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participation for each trade	Goals for female participation for each trade
69.1%	6.9%

These goals are applicable to all the Contractor's construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is actually performed. Goals are published periodically in the Federal Register in notice

form, and these notices may be obtained from any Office of Federal Contract Compliance Programs office.

(c) The Contractor's compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on (1) its implementation of the Equal Opportunity clause, (2) specific affirmative action obligations required by the clause entitled "Affirmative Action Compliance Requirements for Construction," and (3) its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. The Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

(d) The Contractor shall provide written notification to the Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, within 10 working days following award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the --

- (1) Name, address, and telephone number of the subcontractor;
- (2) Employer's identification number of the subcontractor;
- (3) Estimated dollar amount of the subcontract;
- (4) Estimated starting and completion dates of the subcontract; and
- (5) Geographical area in which the subcontract is to be performed.

(e) As used in this Notice, and in any contract resulting from this solicitation, the "covered area" is Honolulu County - State of Hawaii

#### 52.225-12 -- Notice of Buy American Act Requirement-Construction Materials Under Trade Agreements. (May 2002)

(a) *Definitions.* "Construction material," "designated country construction material," "domestic construction material," "foreign construction material," and "NAFTA country construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act--Construction Materials under Trade Agreements" (Federal Acquisition Regulation (FAR) clause 52.225-11).

(b) *Requests for determination of inapplicability.* An offeror requesting a determination regarding the inapplicability of the Buy American Act should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-11 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) *Evaluation of offers.*

- (1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act, based on claimed unreasonable cost of domestic construction materials, by adding

to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(4)(i) of FAR clause 52.225-11.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) *Alternate offers.*

(1) When an offer includes foreign construction material, other than designated country or NAFTA country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit an alternate offer based on use of equivalent domestic, designated country, or NAFTA country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic, designated country, or NAFTA country construction material, and the offeror shall be required to furnish such domestic, designated country, or NAFTA country construction material. An offer based on use of the foreign construction material for which an exception was requested--

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

#### 52.233-2 SERVICE OF PROTEST (AUG 1996)

(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from:

U.S. Army Engineer District, Honolulu  
Corps of Engineers, Bldg 230  
ATTN: Directorate of Contracting, CEPOH-CT  
Fort Shafter, HI 96858-5440

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

(End of provision)

#### 52.236-27 SITE VISIT (CONSTRUCTION) (FEB 1995) – ALTERNATE I (FEB 1995)

(a) The clauses at 52.236-2, Differing Site Conditions, and 52.236-3, Site Investigations and

Conditions Affecting the Work, will be included in any contract awarded as a result of this solicitation. Accordingly, offerors or quoters are urged and expected to inspect the site where the work will be performed.

**(b) An additional organized site visit has been scheduled for--  
July 30, 2003, between 9:00 a.m. and 3:00 p.m. (HST)**

**(c) Participants can contact Kenneth Cabalce at (808)438-8535 for more information**

#### 52.236-28 PREPARATION OF PROPOSALS--CONSTRUCTION (OCT 1997)

(a) Proposals must be (1) submitted on the forms furnished by the Government or on copies of those forms, and (2) manually signed. The person signing a proposal must initial each erasure or change appearing on any proposal form.

(b) The proposal form may require offerors to submit proposed prices for one or more items on various bases, including--

(1) Lump sum price;

(2) Alternate prices;

(3) Units of construction; or

(4) Any combination of paragraphs (b)(1) through (b)(3) of this provision.

(c) If the solicitation requires submission of a proposal on all items, failure to do so may result in the proposal being rejected without further consideration. If a proposal on all items is not required, offerors should insert the words "no proposal" in the space provided for any item on which no price is submitted.

(d) Alternate proposals will not be considered unless this solicitation authorizes their submission.

(End of provision)

#### S-36.4 PRE-PROPOSAL CONFERENCE (JUL 1995)

a. A pre-proposal conference will be conducted by the Government on July 15, 2003 starting at 1:00 to 3:30 p.m. at the Nehelani Clubhouse in the Kukui Room at Schofield Barracks. All planholders (prime contractors, subcontractors, and suppliers) are urged to attend this conference. Planholders who plan to attend should notify the Government of the number of attendees before the date of the conference. Notification can be made as follows:

(1) Telephone: (808)438-8535  
Point of Contact: Kenneth Cabalce

(2) Facsimile: (808)438-6989 / 438-0220

(3) Mail: U.S. Army Engineer District, Honolulu  
Corps of Engineers, Bldg 230  
ATTN: Kenneth Cabalce (CEPOH-PP-A)

- b. Any questions planholders may have concerning the project, plans, or specifications should be submitted in writing, on letterhead stationery, sufficiently in advance of the conference, to permit preparation of answers, which will be provided at the conference. The questions should be faxed as soon as possible, and followed by an original through mail. Use the facsimile number and address shown in paragraph a. above. During the conference, written, signed questions will be accepted, and will be answered during the conference if time permits.
- c. A complete record of the conference, including questions raised by planholders and answers provided by the Government, will be made and a copy furnished to all planholders. However, any answer, clarification, or explanation given at the conference will not qualify or change the terms of the request for proposal (including the plans and specifications). Unless the request for proposal is amended in writing, it will remain unchanged. If an amendment to the request for proposal is issued as a result of the conference, normal procedures relating to issuance and acknowledgement of receipt will apply.
- d. All costs incurred to attend and participate in the pre-proposal conference and any site visits (see paragraph e. below) will be at the expense of the plan holder. This includes, but is not limited to, the cost of transportation, per diem, and hotel accommodations.
- e. Refer to provision entitled SITE VISIT (CONSTRUCTION) in Section 00100 for information on the pre-proposal site visit.

[End of Statement]

#### S-36.33 NOTIFICATION TO OFFERORS – ACCESS TO ARMY INSTALLATIONS.

All vehicle operators must be prepared to provide a valid driver's license, vehicle registration, certificate of insurance and current safety inspection to the security guard prior to entry to the Installation. Offerors should anticipate a delay in entering the Installation and allow sufficient time when attending a site visit or pre-proposal conference or hand delivering an offer.

#### S-36.2 MAGNITUDE OF THE PROPOSED PROJECT [FAR 36.204]

##### (a) Physical Characteristics:

This design/build project will entail preparing the design and constructing the renovation of four three story concrete buildings to house the barracks, community activities, company operations, battalion headquarters, and dining facility for soldiers at Schofield Barracks Quad C. The work will include the demolition of existing building components and replacement of these components with new material that comply with current standards, to include current anti-terrorist and force protection standards. These buildings are historic buildings and all renovation must comply with the Section 106 Historic Preservation regulations. The project will include work for exterior utilities, pavement, and related appurtenances required to support the building renovations.

(b) Estimated Price Range: The estimated price range of this work is between \$25,000,000.00 and \$100,000,000.00.

[End of Statement]

### S-28.3 PENAL SUM AND FORM OF OFFER GUARANTEE

(Applicable to offers exceeding \$100,000)

Each offeror shall submit with its offer a separate offer guarantee using Standard Form 24, Bid Bond, with good and sufficient surety or sureties acceptable to the Government, or other security as provided in the clause entitled OFFER GUARANTEE in the CONTRACT CLAUSES section. This security shall be in the form of twenty percent (20%) of the offered price or three million dollars (\$3,000,000), whichever is less. The penal sum of the bond may be expressed in terms of a percentage of the offered price or may be expressed in dollars and cents.

Failure to submit a offer guarantee by the time and date set for receipt of proposals may be cause for rejection of a proposal, except as provided in provision 52.215-1, Instructions to Offerors-- Competitive Acquisition.

[End of Statement]

### S-2 ASBESTOS ABATEMENT (AUG 1996)

Asbestos abatement is part of the scope of work for the proposed contract. Refer to paragraphs entitled, "ASBESTOS --- (OCCUPATIONAL HEALTH AND ENVIRONMENTAL)" in Section 00800 and applicable sections of the technical specifications and drawings. The Contractor shall inform responsible representatives of their insurer(s)/surety(ies) that asbestos abatement is required for the proposed contract.

[End of Statement]

### S-19.3 SMALL DISADVANTAGED BUSINESS GOAL FOR SMALL BUSINESS SUBCONTRACTING PLAN

When a small business subcontracting plan is required by FAR clause entitled, "SMALL BUSINESS SUBCONTRACTING PLAN", the minimum goal that will be accepted for subcontracting with Small Disadvantaged Business is five percent (5%).

[End of Statement]

### S-19.1 APPROVAL OF SUBCONTRACTING PLAN

If the Contract Clause in this solicitation entitled "Small Business Subcontracting Plan" or its Alternate I or II applies, no award will be made until the subcontracting plan under the stated clause is approved. See sample Small Business Subcontracting Plan at Appendix A.

[End of Statement]

### S-36.38 COST LIMITATION - TARGET CEILING - JUNE 1999

**The target ceiling for contract award for design and construction is \$37,400,000 for MCA and \$21,100,000 for BUP, based on the funds made available for this project. The Government cannot guarantee that additional funds will be made available for award. Offerors are under no obligation to approach this ceiling.**

## SECTION 00120

### PROPOSAL SUBMISSION REQUIREMENTS AND EVALUATION FACTORS

#### 1.0 GENERAL

##### 1.1. Cost of Preparing Proposals

The Government will not reimburse any Offeror any costs incurred in responding to this Request for Proposal.

##### 1.2. Inquiries

Address all inquiries regarding this Request for Proposals to:

U.S. Army Engineer District, Honolulu  
Attn: Ms. Renee Hicks (CEPOH-CT-C)  
Building S-200  
Fort Shafter, Hawaii 96858-5440  
Phone No. (808) 438-8564  
Fax No. (808) 438-8588  
E-Mail: renee.hicks@usace.army.mil

##### 1.3 Submittal of Proposals

Submit proposal packages to the US Army Corps of Engineers ("the Government") as shown in Block 8 of Standard Form 1442.

Proposals received by the Government after the date and time set for receipt of proposals will be handled in accordance with the requirements of Provision "52.215-1, Instructions to Offerors—Competitive Acquisition (May 2001)," subparagraph (c), found in Section 00100.

##### 1.4 Proposal Evaluation

The Government intends to award without discussions to the Offeror with the Lowest Priced, Technically Acceptable (LPTA) proposal, in accordance with the provisions of this solicitation and applicable acquisition regulations. The Government will evaluate offers in accordance with the NON-PRICE EVALUATION FACTORS described in paragraph 2.5 of this section and the Offeror's proposed total price.

Factors/subfactors will be evaluated against the standards described in this section. Each factor/subfactor will receive one of the following ratings:

Acceptable. The proposal demonstrates an acceptable understanding of the requirements. The Offeror's proposed capability is of an acceptable level of quality and justified or substantiated by meeting the requirements of the factor or subfactor.

Unacceptable. The proposal fails to demonstrate an acceptable understanding of the requirements. The Offeror's proposal does not meet the requirements to receive an acceptable rating for the factor or subfactor.

Neutral. Offerors will not be rated favorably or unfavorably if contracts were not issued a final performance evaluation.

## 1.5 Contract Award

Offerors are advised that the Government intends to award without discussions. However during the evaluation of the proposals, clarifications may be requested. Those proposals that receive an unacceptable rating on any of the non-price factors or subfactors may be determined unacceptable and may not receive further consideration for award.

Upon completing the evaluation of all proposals, as long as there is at least one acceptable proposal, the Contracting Officer may, in accordance with the provisions of this solicitation and applicable acquisition regulations, evaluate price for those proposals determined to be technically acceptable. However, if all proposals are determined unacceptable, then the Contracting Officer may conduct discussions with all Offerors. Upon conclusion of discussions, the Contracting Officer may request final proposal revisions from all Offerors and may, upon receipt of final proposal revisions, proceed to award a contract without further discussions or notice.

In the event that award cannot be made to the lowest-priced, acceptable Offeror, the Contracting Officer may conduct discussions only with Offerors that submitted an acceptable proposal. Upon conclusion of discussions, the Contracting Officer may request final price proposal revisions from the Offerors that submitted an acceptable proposal and may, upon receipt of final proposal revisions, proceed to award a contract without further discussions or notice.

## 2.0 PROPOSAL FORMAT

### 2.1 General

Submit proposals three (3) separate envelopes. All proposal revisions shall be submitted as page replacements with revised text readily identifiable, e.g. bold face print or underlining. Proposal replacement pages shall be clearly marked "REVISED", shall show the date of revision, and shall be submitted in the appropriate number of copies (e.g., if four copies of the original page was required, then four copies of the revised page will also be required).

#### 2.1.1 Volume I, Non-Price Proposal

One envelope shall be clearly marked, "VOLUME I, NON-PRICE PROPOSAL, RFP NO. DACA83-03-R-0013." It shall contain an original and six (6) copies of the items provided in response to the Non-Price Factors described in paragraph 2.5.

#### 2.1.2 Volume II, Price Proposal

The second envelope shall be clearly marked, "VOLUME II, PRICE PROPOSAL, RFP NO. DACA83-03-R-0013." It shall contain one original and two copies of the Offeror's completed Standard Form (SF) 1442, using a printed copy of the SF 1442 included in this solicitation.

Volume II shall also include the following:

- One original and two copies of Section 00010, Price Proposal Schedule. Indicate whether or not Facilities Capital Cost of Money is included in the Offeror's costs of performing the work. Proposals that state that Facilities Capital Cost of Money is not included, or proposal that do not address Facilities Capital Cost of Money, will be deemed to have waived Facilities Capital Cost of Money.



- If the Offeror is a joint venture (JV), two copies (certified as a true copy) of the Offeror's executed joint venture agreement and identify the size status for each member of the JV).
- Two copies of the Offeror's completed Section 00600, Representations and Certifications, using a printed copy of Section 00600 included in this solicitation.
- Two copies of the Offeror's completed, if applicable, SF LLL, Disclosure of Lobbying Activities, using a printed copy of the SF LLL included as Appendix A in Section 00600.

#### 2.1.3 Volume III, Subcontracting Plan (only required from Large Business Concerns)

If the Offeror is a large business concern, the Offeror shall submit a subcontracting plan in accordance with FAR 52.219-9 (See Section 00100, Appendix A for a sample).

The third envelope shall be clearly marked, "VOLUME III, SUBCONTRACTING PLAN, RFP NO. DACA83-03-R-0013". Volume III will not be evaluated or rated. Only the selected Offeror's plan will be reviewed and must be approved prior to award of the contract.

#### 2.1.4 Table of Contents

Proposal volumes shall be tabbed. Each of the proposal volumes shall include a Table of Contents that includes the title of the subject matter discussed therein and the page number where the information can be found. The volumes shall be organized in the same order listed in paragraph 2.4 of this Section. Each evaluation factor and subfactor shall be separately tabbed. Proposals that are not correctly tabbed may be considered unacceptable.

### 2.2. Proposal Presentation

Prepare proposals in the English language.

Proposals shall completely address the requirements of the RFP. Elaborate format, binders, special reproduction techniques, and the like are not necessary. However, the proposal shall be neatly organized and bound. All pages, except divider tabs, shall be numbered. Except for divider tabs and revisions sheets, as noted above, plain white 8-1/2" x 11" bond shall be used. However, if drawings or other graphics are included, Offerors may reduce them only to the extent that legibility is not lost.

There is no limit to the number of pages in the non-price proposal. Pages shall be single-sided, numbered, and shall be typed. Type pitch shall be 10 pitch or larger.

Information presented should be organized so as to pertain to only the evaluation factor or subfactor in **the** section **that** the information is presented. Information pertaining to more than one evaluation factor or subfactor should be repeated in the tab for each factor or subfactor.

### 2.3 Proposal Content

Proposals shall be in a narrative format, organized and titled so that each section of the proposal follows the order and format of the factors and subfactors set forth below in paragraph 2.5, "VOLUME I, NON-PRICE PROPOSAL".

Any information, presented in a proposal that the Offeror wants safeguarded from disclosure to other parties must be identified and labeled in accordance with the requirements of Provision "52.215-1, Instructions to Offerors—Competitive Acquisition (May 2001)," subparagraph (e), which is found in Section 00100 of this solicitation. The Government will endeavor to honor the restrictions against release requested by Offerors, to the extent permitted under United States law and regulations.

The proposal must set forth full, accurate, and complete information as required by this solicitation. The Government will rely on such information in the award of a contract. By submission of an offer, the Offeror agrees that all items in its proposal (key managerial and technical home office and on-site personnel, subcontractors, material and equipment manufacturers, targets for utilization of eligible SDB concerns, etc.) will be used throughout the duration of the contract and any substitutions of any item will require prior approval of the Contracting Officer.

## 2.4 Evaluation Factors

All proposals will be evaluated on non-price and price factors. Offerors are required to provide data addressing all stated factors in a clear and understandable format. If an Offeror does not have data relating to a specific factor, it shall be clearly stated in the proposal. Proposals that do not clearly address all factors may be considered unacceptable and may not receive further consideration.

All factors and subfactors within a factor have equal importance.

### NON-PRICE FACTORS (Volume I):

#### Factor I, Experience

Subfactor A - Construction Experience

Subfactor B - Design-Build Experience

#### Factor II, Past Performance

Subfactor A - Construction

Subfactor B - Design-Build

Subfactor C - Customer Satisfaction

~~Factor III, Project Management (Deleted)~~

Factor IV, Small Business Program, Past performance in complying with Small Business Subcontracting Plan.

### PRICE (Volume II)

## 2.5 Volume I, Non-Price Proposal

Data provided in response to the non-price factors described below shall be included in Volume I, "Non-Price Proposal". All references to Offeror shall include any proposed members of the Construction team meeting the criteria stated in paragraph 2.5.2 below.

### 2.5.1 Relevant Contracts

For a contract to be considered relevant, the contract must have been awarded to the Offeror after 1 July 1993 and has been declared substantially complete **between 1 July 1997 and 1 July 2003**, and each contract must have involved at least four (4) of the characteristics listed below for either a Construction contract or a Design-Build contract, as applicable. **Evidence of substantial completion must be included in the proposal in order for a contract to be considered relevant.**

**An IDIQ-type contract** may be **considered relevant** only if a single task order on that contract involves at least four (4) of the characteristics for either a Construction contract or a Design-Build contract, as applicable. Task orders may not be combined in order for the contract to meet the criteria for relevancy. Both the contract and the **individual** task order must meet the award date and **substantial completion** criteria stated above. **The characteristics of a single task order may be applied towards meeting the required characteristics for either a Construction contract or a Design-Build contract, as applicable.**

Characteristic	Construction Contracts	Design-Build Contracts
1	Contract amount at time of award was equal to or greater than \$25,000,000	Contract amount at time of award was equal to or greater than \$10,000,000
2	Contract involved 100,000 square feet or more of Renovation Work	Contract involved 100,000 square feet or more of Renovation Work
3	Work involved the integration of various building systems, including mechanical, electrical, fire alarm and fire protection	Work involved design and integration of various building systems, including mechanical, electrical, fire alarm and fire protection
4	Construction involved work on multiple structures, multiple floor levels, with multiple uses	Design involved multiple structures, multiple floor levels, with multiple uses
5	Work involved management and supervision of many different trades, including at least those involved in site work, interior and exterior electrical, HVAC, plumbing, masonry, and concrete work	Work involved management and supervision of many different trades, including at least those involved in site work, interior and exterior electrical, HVAC, plumbing, masonry, and concrete work
6	Work involved hazardous material identification, abatement, and removal, including both lead-based paint and asbestos	Design addressed hazardous material identification, abatement, and removal, including both lead-based paint and asbestos
7	Work involved removal of and cleanup of <b>petroleum</b> -contaminated soils	Design involved removal and cleanup of <b>petroleum</b> -contaminated soils
8	Work was managed through the use of a Network Analysis System (NAS) and involved multiple construction phases	Design and construction submittals were managed through the use of a Network Analysis System (NAS)
9	Contract involved construction on a U.S. Government Military Base	Contract involved construction on a U.S. Government Military Base

## 2.5.2 Factor I, Experience

Data provided in support of this factor shall clearly demonstrate the Offeror's ability to meet the requirements of the contract based on its experience on relevant contracts as defined in paragraph 2.5.1. Only experience considered relevant to this project will be considered.

Complete a Contract Data Sheet for each contract provided in support of this factor. This sheet is included as Attachment 1 to this specification section. All requested information must be provided. Failure to provide any of the requested data may be cause to eliminate a contract from consideration in the evaluation. Only the form provided as Attachment 1 will be accepted. Data submitted in any other format will be eliminated from consideration.

The Offeror shall provide a narrative description of each relevant contract included in its proposal in addition to the Contract Data Sheet. The narrative shall clearly explain how the contract fulfills the experience characteristics for which it is being submitted. No more than five (5) pages shall be submitted for each contract, including the Contract Data Sheet and any continuation pages. **Pages exceeding this 5-page limit will not be considered.**

If the Offeror intends to rely on its joint venture partner's experience, the Offeror shall submit a Contract Data Sheet (Attachment 1) and narrative description for the joint venture partner's relevant experience. In order to demonstrate the depth of its experience, Offerors may submit data for themselves and their joint

venture partner for the same contract. However, the submission of data for multiple team members on the same contract will only be counted as a single contract.

#### 2.5.2.1 Subfactor A, Construction Experience

Offerors shall identify relevant contracts, as defined in paragraph 2.5.1, in which they were the prime contractor.

##### 2.5.2.1.1 Evaluation Standards

Acceptable	The Offeror has submitted one or more relevant contracts (para 2.5.1). These contracts demonstrate that the Offeror has had experience in all of the nine (9) listed Construction Contracts characteristics. <b>Evidence of substantial completion is provided for all relevant contracts.</b>
Unacceptable	Based on the submitted relevant contracts, the Offeror has not demonstrated experience on at least one of the Construction Contract characteristics, <b>or evidence of substantial completion is not provided for all relevant contracts.</b>

#### 2.5.2.2 Subfactor B, Design-Build Experience

Offerors shall identify relevant contracts, as defined in paragraph 2.5.1, in which they were the prime contractor.

##### 2.5.2.2.1 Evaluation Standards

Acceptable	The Offeror has submitted one or more relevant contracts (para 2.5.1). These contracts demonstrate that the Offeror has had experience in all of the nine (9) listed Design-Build Contracts characteristics. <b>Evidence of substantial completion is provided for all relevant contracts.</b>
Unacceptable	Based on the submitted relevant contracts, the Offeror has not demonstrated experience on at least one of the Design-Build Contract characteristics, <b>or evidence of substantial completion is not provided for all relevant contracts.</b>

#### 2.5.3 Factor II, Past Performance

Data provided in support of this factor shall clearly demonstrate the Offeror's ability to meet the requirements of the contract based on his documented past performance history on relevant contracts. Only past performance on relevant contracts will be considered (see paragraph 2.5.1 above).

Provide a copy of the final overall performance evaluation for each of the relevant contracts identified in Factor I, Subfactors A and B, that were completed between 1 July 1997 and 1 July 2003. Only performance evaluations for the Offeror will be considered. Provide complete and accurate documentation for each evaluation. Undocumented performance evaluations may not be considered. The Government may use data provided by the Offeror and data obtained from other sources. While the Government may elect to consider data obtained from other sources, the burden of providing thorough and complete past performance information rests with the Offeror.

##### 2.5.3.1 Subfactor A, Construction

**Documentation shall be provided for each of the final overall performance evaluations received for the relevant contracts submitted in Subfactor IA, or if one was not received, a statement attesting to the situation shall be provided.**

#### 2.5.3.1.1 Evaluation Standards

Acceptable	The Offeror has received no less than satisfactory on all final performance ratings on <b>the submitted relevant</b> contracts; and the Offeror must not have received an Unsatisfactory performance evaluation on any Federal Government contract after 1997.
Unacceptable	<b>The Offeror has</b> received less than a satisfactory performance rating <b>on at least one of the submitted relevant contracts</b> ; or the Offeror has received an Unsatisfactory performance evaluation on at least one Federal Government contract after 1997.
Neutral	Offerors will not be rated favorably or unfavorably if <b>all</b> contracts were not issued a final performance evaluation.

#### 2.5.3.2 Subfactor B, Design-Build

**Documentation shall be provided for each of the final overall performance evaluations received for the relevant contracts submitted in Subfactor IB, or if one was not received, a statement attesting to the situation shall be provided.**

##### 2.5.3.2.1 Evaluation Standards

Acceptable	The Offeror has received no less than satisfactory on all final performance ratings on <b>the submitted relevant</b> contracts; and the Offeror must not have received an Unsatisfactory performance evaluation on any Federal Government contract after 1997.
Unacceptable	<b>The Offeror has</b> received less than a satisfactory performance rating <b>on at least one of the submitted relevant contracts</b> ; or the Offeror has received an Unsatisfactory performance evaluation on at least one Federal Government contract after 1997
Neutral	Offerors will not be rated favorably or unfavorably if <b>all</b> contracts were not issued a final performance evaluation.

#### 2.5.3.3 Subfactor C, Customer Satisfaction

A customer satisfaction questionnaire is provided at the end of this section as Attachment 2. For each of the relevant contracts identified in Factor I, Subfactors A and B, Offerors shall complete Part A. Offerors shall send the partially completed forms to the Contracting Officer for the identified contract (respondent) for completion of Part B. Only one questionnaire for each relevant contract will be accepted. The respondent shall return completed questionnaires directly to the following address:

US Army Engineer District, Honolulu  
CEPOH-CT-C  
Attn: DACA83-03-R-0013, Customer Satisfaction Questionnaire  
Bldg. 230  
Fort Shafter, HI 96858-5440

Fax: 808-438-8588

Respondents should be requested to return questionnaires no later than the closing date of the solicitation. The Government advises Offerors that they are responsible for ensuring timely receipt of completed questionnaires. Questionnaires that are not received may impact an Offeror's rating for this subfactor. Questionnaires received directly from offerors will not be considered in the evaluation. Questionnaires that are missing the Contracting Officer's receipt acknowledgement signature may not be considered. Only **questionnaires** submitted on the provided form (Attachment 2) will be considered.

A copy of page 1 of all partially completed **questionnaire** sheets sent shall be included in this tab. Ensure that the reference number is completed on each **questionnaire** sheet to correctly match **questionnaires** to the contracts listed in Factor I.

#### 2.5.3.3.1 Evaluation Standards

Acceptable	At least 50% of the completed questionnaires are received <b>for the relevant contracts submitted in Factor I, Subfactors A and B</b> ; and on the questionnaires received <b>for the relevant contracts submitted in Factor I, Subfactors A and B</b> , all of the ratings for questions 2 through 9 were no less than satisfactory.
Unacceptable	Less than 50% of the completed questionnaires are received <b>for the relevant contracts submitted in Factor I, Subfactors A and B</b> , or on the surveys received <b>for the relevant contracts submitted in Factor I, Subfactors A and B</b> , one or more of the ratings for questions 2 through 9 were less than satisfactory.

#### ~~2.5.4 Factor III, Project Management (DELETED)~~

~~Provide a diagram depicting the proposed management organization. The chart shall clearly identify lines of authority and areas of responsibility. Include a narrative description of how the management team will operate, and the specific duties and responsibilities of the key personnel. It is not necessary to identify individuals by name for any position.~~

~~Incorporate into the description, an organizational chart depicting the on-site managerial and technical staff. At a minimum, the Offeror must include the following key positions: Project Manager, Project Superintendent, Contractor Quality Control System Manager, Design Quality Control Manager, Safety Officer. In addition to these positions, the Offeror should identify any other managerial and/or technical positions that will be used on this contract to demonstrate the Offeror's ability to provide quality work in both the design and construction aspects of the contract within the contract completion period.~~

~~The narrative shall describe the Offeror's proposed on-site organization and structure, and shall describe how the Offeror intends to monitor and control timeliness, quality, and safety of the work at the job site, including the work of any subcontractors on all phases of the contract.~~

#### ~~2.5.4.1 Evaluation Standards~~

~~The Government will review and evaluate the organization chart and other pertinent information provided as either acceptable or unacceptable. The Offeror's proposal submission for this factor must demonstrate the offeror's ability to complete the project successfully through the use of an efficient organizational structure that allows for streamlined reporting processes, proper subcontractor management, ability to manage resources, and a technically knowledgeable and capable on-site staff.~~

Acceptable	<del>The proposal includes all requested information for the factor. The diagram is complete and easy to understand. Lines of authority and areas of responsibility are well defined and are appropriate for the scope of work. The narrative complements the diagram and is in sufficient detail to demonstrate the Offeror's understanding of the effort needed to successfully manage the contract.</del>
Unacceptable	<del>The diagram is incomplete, key positions are not included; or the diagram is unclear, lines of authority or areas of responsibility are not readily discernible; or the narrative does not match the diagram; or the proposed organization is inappropriate to the effort needed to successfully manage the contract.</del>

2.5.5 Factor IV, Small Business Program, Past performance in complying with Small Business Subcontracting Plan.

Offerors shall submit data that demonstrate its use of Small Business Concerns. Small Business Concerns include small disadvantaged businesses (SDB), women-owned small businesses, HUBZone small businesses, veteran-owned small businesses and service disabled veteran-owned small businesses.

Provide SF 294' s, "Subcontracting Report for Individual Contracts" for projects of similar scope and magnitude. Provide reasonable justifications if goals were not met.

2.5.5.1 Evaluation Standards

Acceptable	Offeror's Small Business Subcontracting Plan goals were met or reasonable justifications for not achieving these goals provided. Offers from Small Business concerns shall receive an acceptable rating..
Unacceptable	Offeror's Small Business Subcontracting Plan goals were not met and no justification for not achieving these goals is provided.



**CONTRACT DATA SHEET**

**RFP No. DACA83-03-R-0013**

The data provided on this sheet will provide supporting information for the Offeror's Experience and Past Performance (Factors I & II). Use this form to document relevant contracts that were awarded after 1 July 1993 and substantially completed **between 1 July 1997 and 1 July 2003**. Properly referenced continuation sheets may be used if needed. Submit no more than 5 pages per contract -- data sheet plus continuation sheets.

Offeror's Name:

Phone Number:

Fax Number:

Point of Contact:

E-Mail Address:

Contract No:

**Reference #: Vol I, Tab \_\_\_\_\_, Contract # \_\_\_\_\_**

Applicable characteristics (paragraph 2.5.1, 1 - 9):

*(List characteristics by number here, describe on continuation sheets)*

Contract Title:

Location:

Type of Contract (i.e. firm-fixed, price, cost reimbursable, IDIQ, etc.):

Contract Description:

Award Date:

Original Completion Date:

Actual Completion Date:

Award Amount:

Final Contract Price:

Was Offeror the PRIME or a SUB?

Percentage of Contract Performed by Offeror:

Type/scope of work performed by the Offeror:

Overall Final Contract Performance Rating:

Date of Evaluation:

Quality Awards, Letters of Appreciation/Commendation, Written Overall Performance Evaluations Received. List documents here, include document(s) in Volume I, Factor III, Experience and Past Performance tab.

Type and Extent of Subcontracting. List names of major subcontractors used.

Describe any other factors relevant to experience or past performance that demonstrate the Offeror's capabilities and qualifications in relation to the proposed contract.

End user (i.e. DPW, BCE, etc.)

Point of Contact (Name & Title):

Phone Number:

Fax Number:

E-mail Address:



CUSTOMER SATISFACTION QUESTIONNAIRE

**PART A** (to be completed by Offeror)

Reference #: Vol I, Tab \_\_\_\_\_, Contract # \_\_\_\_\_

Name of Offeror: \_\_\_\_\_

Contract Number/Contract Title /Location \_\_\_\_\_

Contract Description: \_\_\_\_\_

Award Date: \_\_\_\_\_

Original Completion Date: \_\_\_\_\_

Actual Completion Date: \_\_\_\_\_

Award Amount: \_\_\_\_\_

Final Contract Price: \_\_\_\_\_

% of work and type of work performed by the Offeror: \_\_\_\_\_

=====

**PART B** (to be completed by Respondent)

Received: \_\_\_\_\_  
(signature of Contracting Officer)

Organization Name: \_\_\_\_\_

Your Name: \_\_\_\_\_

Your Title: \_\_\_\_\_ Phone Number: \_\_\_\_\_

Your role on this contract: \_\_\_\_\_

Name and phone number of any additional person(s) who may or may not have a different opinion on this contractor's job performance.

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\*\*\*\*\*

1. Describe any special conditions affecting the work.

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**Circle the appropriate rating and provide supporting narrative below for questions 2 - 8**

2. How would you rate the quality of construction in terms of compliance with the contract plans and specifications?

Unsatisfactory      Marginal      Satisfactory      Very Good      Outstanding

---

---

---

3. How would you rate the timeliness of performance, taking into account all excusable delays?

Unsatisfactory      Marginal      Satisfactory      Very Good      Outstanding

---

---

---

4. How would you rate the cost of the contract, in terms of initial price reasonableness and control of changes and claims?

Unsatisfactory      Marginal      Satisfactory      Very Good      Outstanding

---

---

---

5. How would you rate the offeror's ability and cooperativeness in complying with other contract terms and conditions?

Unsatisfactory      Marginal      Satisfactory      Very Good      Outstanding

---

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6. How effective was the Offeror's management of the administrative aspects of performance, such as communicating and performing routine coordination?

Unsatisfactory      Marginal      Satisfactory      Very Good      Outstanding

---

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7. How would you rate the Offeror's willingness to cooperate with, and assist the customer in routine matters? Non-routine matters?

Unsatisfactory      Marginal      Satisfactory      Very Good      Outstanding

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8. What is your assessment of the Offeror's business integrity?

Unsatisfactory      Marginal      Satisfactory      Very Good      Outstanding

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9. How would you rate the overall performance of the Offeror? (Please provide comments, especially if Outstanding or Unsatisfactory)

Unsatisfactory      Marginal      Satisfactory      Very Good      Outstanding

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10. Would you recommend using this firm for any future similar types of work for your organization, and why or why not?

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Thank you very much for responding to this questionnaire. Please mail or fax your completed questionnaire to the following address:

DACA83-03-R-0013

00120-19

AM-0002

**Part B** - Attachment 2

Page 3 of 3

US Army Engineer District, Honolulu, CEPOH-CT-C  
Attn: DACA83-03-R-0013, Customer Survey  
Bldg. 230  
Fort Shafter, HI 96858-5440

**Phone:** 808-438-8564 (Ms. Renee Hicks) fax 808-438-8588

## **RESPONSES TO CONTRACTOR QUESTIONS**

### **Nan, Inc., Walter Yuen/Patrick Shin**

1. Per Paragraph 2.3.1, Relevant Contracts, page 00120-4, for a contract to be considered relevant, one of the criteria is that the contract needs to be “declared substantially complete.” This is an unreasonable requirement as a project can be declared “substantially complete”, yet the Government does not issue the final performance evaluation (PE) until after all contractual obligations (i.e. punchlist, modifications) are met. It has been in our experience that this process can take from 6 months to 1 year after the project is “substantially complete” to receive a final PE. Therefore, we ask that the Government also consider interim PE’s as well.

In addition, please define what is considered “substantially complete” for a single construction or design-build contract. For example, if a project is completed in that personnel are allowed to occupy the facility, yet the Contractor is currently completing punchlist items or Government approval of modifications are pending; would such a project be considered “substantially complete”? Or how about in the case of a phased-project involving multiple buildings, of which buildings are turned over after each is completed; would this project be “substantially complete” if majority of the buildings are completed (i.e. 3 out of 5 buildings)?

**Response** - The intent of identifying relevant contracts as being those that have been declared substantially complete is to allow offerors to highlight experience on completed contracts even though the offeror may not have received a final performance evaluation for that contract. In that case, the offeror must provide, with their offer, documentation from the contracting activity, or the contracting officer, stating that the contract has been declared substantially complete, as defined by that contracting activity. Contracts identified by an offeror that have a final performance evaluation will be evaluated for both experience and past performance. However, contracts identified by an offeror as being only substantially complete (no final performance evaluation) will be evaluated only for experience and will receive a Neutral rating for past performance. Interim performance evaluations will not be considered as evidence of contract substantial completion. Similarly, if a contract contains multiple projects, offeror must provide documentation of contract substantial completion not documentation that some of the projects have been declared substantially complete.

2. In relation to the above questions, in regards to an IDIQ-type contract, would the contract be considered “substantially complete” for either of these two scenarios: (a) the final option year of the contract has ended, yet task orders within the contract are on-going, and dependent upon the definition of “substantially complete:”, are not of one of the submitted task orders or (b)

majority of the contract is completed (i.e. for a base and four (4) option year contract, base year and two option years are completed)? Please define what is considered “substantially complete” for an IDIQ-type contract.

**Response** - For an IDIQ contract to be considered substantially complete, as stated in the RFP, both the submitted task order and the contract must meet the criteria for substantially completion.

3. In relations to Questions 1 and 2, we particularly feel that a contract 50% complete can be evaluated just as fair as a contract that is “substantially complete”, as majority of the problems on a project occur during the set-up and initial phases of the project. In addition, would it not be more advantageous in the Government’s evaluation of this RFP to award to an Offeror that is currently managing a sizeable staff and an extensive workload, rather than a company who performed at the same capacity, but five years ago? We feel this would be since projects that are most current would reflect an Offeror’s current management style/program, which carries through to the end of the project. Additionally, the Government will be able to better understand the Offeror on on-going projects in comparison to an Offeror that completed a project awhile ago, and may have experienced a downturn in projects in the time since. With the current requirements, the Government is eliminating current projects, and therefore, will not be getting the “best-value” out of their evaluation. Therefore, we feel that current projects should carry the same weight as past projects, in regards to relevant experience and past performance, and that the Government should include on-going projects in their evaluation of this RFP.

**Response** - The concerns surfaced by the offeror were considered during the establishment of the solicitations evaluation criteria. The Government believes that the evaluation factors and criteria meets the needs of the Government.

4. Regarding the request for a Small Business Subcontracting Plan from Large Business Concerns, as this is a design-build contract, it is very difficult for an Offeror to list definite subcontractors for this project at the time of bid submittal. If an Offeror is required to list subcontractors to be used on this project, this will limit the competition to only large businesses, as most small businesses do not have the capacity to estimate a project of this size. Therefore we ask that the Government hold the Offeror liable to the small business percentage goals presented in its plan, and not necessarily the goals for a specific trade.

For example, if an Offeror proposes to use a women-owned small business painting subcontractor for an X% of the total planned subcontracting dollars. However, after award of the project the Offeror finds that that particular subcontractor is unable to perform on this project. In that case, an Offeror should not be held liable to replace the trade of the subcontract, but rather the

percentage proposed for that small business subcontracting concern (i.e. replace with a WOSB plumbing contractor for X%).

**Response** - The offeror should include the names of those contractors with whom the offeror has a working relationship. Past experience may be a good indicator. As far as compliance with the **subcontracting plan**, DFARS 219.704(a)(4) states:

"In those subcontracting plans which specifically identify small, small disadvantaged, and women-owned small businesses, prime contractors shall notify the administrative contracting officer of any substitutions of firms that are not small, small disadvantaged, or women-owned small businesses for the firms listed in the subcontracting plan. Notifications shall be in writing and shall occur within a reasonable period of time after award of the subcontract. Contractor-specified formats shall be acceptable."

I interpret this to mean that the contracting officer **does not** need to be notified if the prime contractor substitutes a SDB with another SDB, the subcontractor's trade does not enter into the picture. The objective is to ensure that you provide a good faith effort to ensure that the SDB goal is met or exceeded. (For example, if you do not use an SDB plumber, you should award more to SDB carpenters or electricians.)

5. Paragraph 2 under Paragraph 2.5.1, Relevant contracts, page 00120-5, states, "IDIQ- type contracts may be submitted only if a single task order on that contract involves at least four (4) of the characteristics for either a Construction contract or a Design-Build contract, as applicable." Therefore, we interpret this sentence to mean that if an Offeror submits an IDIQ-type contract, with a contract value over \$25 million and has more than one task order that meets at least four (4) of the specified characteristics for either a Construction contract or a Design-Build contract, this IDIQ-type contract, as a whole, will qualify in demonstrating experience in meeting Characteristic #1. Do you concur?

**Response** - No, a task order type contract can be counted only once

6. Suppose that an Offeror submits an IDIQ-type contract with various task orders (Task Orders A, B, and C) that involve at least four (4) of the characteristics for either a Construction contract or a Design-Build contract, which are as follows:

Task Order A meets Characteristics #2,3,4,5  
Task Order B meets Characteristics #4,5,6,7  
Task Order C meets Characteristics #6,7,8,9

In evaluating the contract, will the Offeror be evaluated as meeting Characteristics #2 through #9?

**Response** - The situation presented by the offeror will not occur. Offerors are reminded that only one task order (and its relevant characteristics) will be considered for an IDIQ contract. In the offeror's example, the evaluation will only consider the first TO (in this case TO A) and any other TO will be discarded - therefore if the following is submitted,

Task Order A meets Characteristics #2, 3, 4, 5 (will be counted)  
Task Order B meets Characteristics #4, 5, 6, 7 (will NOT be counted)  
Task Order C meets Characteristics #6, 7, 8, 9 (will NOT be counted)

The Offeror will be evaluated as meeting only Characteristics #2 through #5.

7. We are currently working on a project at Quad F, Schofield Barracks (Contract No. DACA83-02-C-0001) with elements of work similar to that of this Quad C project. However, our contract did not involve ACM removal, as it was performed by another contractor, R&D Technologies, on a separate contract, prior to our mobilization on the project. Therefore, as our contract price did not involve asbestos removal, would it be possible for the Government to disclose the contract amount for the work performed on R&D's contract?

**Response** - The Government will not be disclosing the requested information. As is standard industry practice, the Offeror is responsible for obtaining his own pricing information necessary to prepare an offer.

8. In relation to the above-mentioned question and project, our proposal also did not include consideration of AT/FP requirements. Would the government disclose the Government's estimated amount, as well as the Offeror's option amount?

**Response** - It is not standard practice for the Government to release its estimates, unless revealed in a public bid opening forum.

9. The RFP documents include Attachment 15, Proposal Data Sheet. This form indicates that it is to be provided at the beginning of the Offeror's proposal. However, it is not referenced anywhere else in the RFP documents. Is this Attachment required for proposal submission?

**Response** - Attachment 15, Proposal Data Sheet, will be deleted by an amendment.

**10.** In the Statement of Work, Chapter 6, Structural Design, within para. 6-5.5 on page SOW 6-4 of the RFP, referencing AT/FP, one paragraph mentions “The requirement to design and retrofit existing floor slabs (with FRP or similar top slab reinforcing) to withstand upward blast loads as given by paragraph B-2.1.3 of UFC 4-101-01 shall be treated as a bid option to this project...”. However, Section 00010, Proposal Schedule does not reflect this option. Please review and clarify.

**Response** - Bid Option will be added by an amendment.

**Dick Pacific Construction Co., Inc., Kelvin Osborne/Edward Requilman**

**11.** Where reference is made to Quad F are the documents going to be furnished, i.e. Gear wash, Design? Quad “F” Gymnasium design solution 15-11?

**Response** - Gear Wash information is provided in Attachment 25. No information will be provided for the Gymnasium.

**12.** Will the original drawings and photos for Quad C be provided to the Contractor.

**Response** - Existing architectural floor plans were issued by an amendment. After the contract is awarded the contractor may obtain original drawings and photographs of Quad C, as available, from the Directorate of Public Works and the Schofield Barracks Museum, respectively.

**13.** Similar but As-built drawings

**Response** - Existing architectural floor plans were issued by an amendment. After the contract is awarded the contractor may obtain as-built drawings, as available, from the Directorate of Public Works.

**14.** Do I need to conform to life safety code (NFPA 101) when existing floor transition is greater than 1”? Do we need to fill adjacent floor to meet the requirement?

**Response** - Yes, NFPA 101 must be complied with.

**15.** Can small business plan be submitted 10:00 am following day of bid?

**Response** - No, plan shall be turned in with proposal on due date

**16.** Can you provide us the following to be used in preparing for our bid proposal?

I. RFP CAD design drawings.

2. Plans of existing condition of the buildings to be renovated.
3. Selective demolition plans of the renovated buildings.

**Response** - 1) CAD drawings will not be provided prior to contract award.

2) See responses to Questions 12 & 13.

3) Demolition plans will not be provided.

**17.** Can we replace the specified material to a renewable material, (i.e. VCT vs. linoleum)?

**Response** - Linoleum may be used in lieu of vinyl composition tile. Other material substitutions will need the Contacting Officer's approval.

**18.** Can you provide a RFP facility SPiRiT rating sheet?

**Response** - A SPiRiT rating analysis will be provided by an amendment.

**19.** Can you postpone and move the date for the submission of the bid proposal?

**Response** - Revised proposal closing date will be issued by an amendment.

**Cedric D.O. Chong and Associates, Inc., Avin Oshiro**

**20.** RFP mandates "low ozone depleting" refrigerants for chillers. Will this allow us to use R-22, R134a or R-123?

**Response** - Refrigerants shall comply with SOW Ch 10 which states that the design shall comply with UFGS 15620A.

**21.** No mention of freezers (not compressors) or chill boxes in the kitchen. Do we replace, reuse or refurbish? Do we improve design? Are the conditions the same?

**Response** - See SOW Ch 5, PARA.5-1.2.4, requiring demolition of all existing interior partitions. Regarding mechanical items specified in SOW Ch 8 (Plumbing), Ch 10 (Heating, Ventilating, and Air Conditioning), Ch 11 (Energy Conservation) and Ch 12 (Fire Protection) or shown on M-, P-, and FP- sheets shall be new unless otherwise indicated. All existing items shall be removed unless otherwise indicated.

**22.** Sanitary piping on plan shows 2 lines. Why can't we connect all the risers into one larger main?



**Response** - The 2 lines shown on the sanitary piping plan sheet P-3 and 1/Detailed Plumbing Floor Plan on Sheet P-4 may be combined as long as the following minimum design criteria are met:

a. The minimum distance required by IPC is provided (i.e. for connections to offsets and bases of stacks, see IPC Chapter 7, paragraph 704.3).

b. No floor cleanouts are located in billeting modules.

**23.** Do we process the paperwork to obtain HECO rebate?

**Response** - If necessary, an amendment will be issued to add this requirement to the RFP.

**24.** DDC controls states "BACNET" compatible. Are other systems allowed? Is compatibility of the new DDC system with an existing system required or necessary?

**Response** - See SOW Ch 10, para. 10-9, building controllers shall be fully BACNET compatible.

**25.** There are no specifications on control points. Does this mean we can provide only a minimum system?

**Response** - Minimum requirements on control points are stated in SOW Chapter 10 paragraph 10-9.

**26.** Are there minimum efficiencies for the equipment?

**Response** - As noted in Chapter 10 paragraph 10-1.2, minimum efficiencies shall be in accordance with UFGS.

**27.** Do we follow mechanical RFP or directive from energy efficiency section?

**Response** - The design shall comply with Ch 10 and Ch 11. Items provided shall be in accordance with both chapters. If there are specific conflicting items, it shall be brought to the attention of the Contracting Officer.

**Hawaiian Dredging Construction Co., Bruce Patterson**

**28..** SOW 5-1, Int. Furn (5-1.1.2); Sow 14-1, Int. Furn (14.1.2.I); SOW-2: Who installs?

**Response** - SOW Ch 5, PARA. 5-1.1.2, and SOW Ch 2, para. 2-1.7, indicate which items are Government or Contractor installed.

**29.** When can we expect the funds for this project to be appropriated?

**Response** - Funds for the project were appropriated and RFP will be revised by an amendment to correct this information.

**30.** Will this contract bid date be extended, if so when will it be announced?

**Response** - See response to Question 19.

**31.** T-3 Dept of Army Facility Stdization Pgm; Std CO Oper Facility Feb 1994: How can we see a copy of this?

**Response** - Copies of the Standard Company Operations Facility are available for review at the U.S. Army Engineer District, Honolulu, Contracting Office.

**32.** If “as built” are not available, what can we expect to verify some of the structural elements more clearly?

**Response** - There are no structural as-built drawings for Quad C. Ch 6, Structural Design, of the Scope of Work will be revised by an amendment to provide more information on the existing structure.

**33.** 5-1.2.4 “Roof structure and roofing will have to be removed ... “ need more detail.

**Response** - The RFP will be amended to provide more information on the roof structure.

**34.** What surrounding areas will be allowed for contractor equipment?

**Response** - Information on the Contractor’s Operation and Storage Area will be provided by an amendment.

**35.** Will there be additional opportunities to walk thru the project site?

**Response** - The date and time for an additional site visit will be issued by an amendment.

1       - - - - - x

2               In the Matter of:               :

3       PROJECT NO. FY03 MCA/BUP PN52068/69   :

4       Whole Barracks Renewal Brigade       :

5       Complex Phase 3A, Quad C,           :

6       Schofield Barracks               :

7       - - - - - x

8

9                               Schofield Barracks  
10                              Nehelani Club  
11                              Kukui Room  
12                              Wahiawa, Hawaii  
13                              Tuesday, June 15, 2003

14

15               The above-entitled matter came on for discussion,  
16       pursuant to notice, at 1:05. p.m.

17       Before:

18               Panel Chairman Kenneth Cabalce

19               Panel Member Renee Hicks

20               Panel Member Richard Carlile

21               Panel Member Roy Funinaka

22               Panel Member Paul Kai

23               Panel Member Dorinda Won

24               Panel Member Ivan Awa

25               Panel Member Greg Kim

              Panel Member Tom Goto

26

1 APPEARANCES: (as reflected on sign-in sheet)

2 Reynold Chun

3 Dorinda Won

4 Lloyd Arakaki

5 Edna Sakai

6 Patrick Shin

7 Walter Yuen

8 Amado Aguinaldo

9 Virginia Murison

10 Kyle Pang

11 Kelvin Osborne

12 David McVeigh

13 Richard Carlile

14 Bruce Patterson

15 Paul M. Kai

16 Ivan Awa

17 Renee Hicks

18 Kenneth Cabalce

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## P R O C E E D I N G S

PANEL CHAIRMAN CABALCE: I guess we can get started.

For those who came to the site visit -- it looks like most of you went to the site visit this morning over at Quad C. At this time now we're going to have the preproposal conference. I'd like to explain a few things. Well, first of all, I'm going to have to take a break in a few minutes and go in my car because I locked my car keys in the car, and my son is bringing the car keys up. I have the sign-in roster, everything like that. I'm trying to do this by memory.

The reason we're here right now is the preproposal conference. There was some ground rules included in the RFP. First of all, before we get started, if you guys don't know me already, my name is Ken Cabalce. I'm the project manager for the project. And today, on the Army Corps of Engineer side, we have the designers and some representatives from different offices at the district. And I think before we get started, I'd like to introduce who we have here.

Down here we have Richard Carlile. He's from our Office of Counsel. Sitting next to him is Renee Hicks. She's our contract specialist. And up in the front row we have Tom Goto who's our electrical designer, Paul Kai, who's our architect, Ivan Awa, who's our structural engineer. And then this side we have our mechanical designer Reynold Chun. And also we have -- from our construction office, we have

1 Dorinda Won. She's going to be also on the source evaluation  
2 board.

3 And as I started to say, there are some ground rules  
4 for this conference and what those rules are is that all  
5 questions posed here, the preproposal should be submitted in  
6 writing. What that means if you have a question now, if you  
7 have a piece of paper, write your question down, or  
8 questions, your name and the office you're representing.

9 We'll take all of your questions and not necessarily  
10 provide responses to the questions at this forum, and  
11 responses to those questions don't come -- doesn't affect the  
12 request for proposal, okay. The only way it's going to  
13 affect the request for proposal is when we issue an amendment  
14 saying how the request for proposal is changed based on the  
15 response as provided. And just to get started, has anyone  
16 already submitted -- people submit questions to the  
17 contract --

18 PANEL MEMBER HICKS: We had one firm submit their  
19 questions.

20 PANEL CHAIRMAN CABALCE: We can get started with those.  
21 We'll start with the questions we have from contracting, go  
22 down the list. And if any of you do have additional  
23 questions, please write it up, put your name and company  
24 name, and then we'll start going down the list. I think my  
25 son is coming up, so I'll be right back.

1 (Recess.)

2 PANEL CHAIRMAN CABALCE: We'll provide you a copy of  
3 that. This reporter here is just to record the questions  
4 asked and the responses, so we have an accurate record of  
5 what's being talked about at this meeting. So when you  
6 speak, please say your name and your company.

7 MR. YUEN:: My name is Walter Yuen from Nan, Inc.

8 First question, "Per Paragraph 2.5.1, Relevant  
9 Contracts, page 00120-04 for contract to be considered  
10 relevant, one of the criteria is that contract needs to be  
11 declared substantially complete. This is an unreasonable  
12 requirement as a project can be declared substantially  
13 complete, yet the Government does not issue the final  
14 performance evaluation until after all contractual  
15 obligations are met.

16 "It has been in our experience that this process can  
17 take from six months to one year after the project is  
18 substantially complete to receive a final project evaluation.  
19 Therefore, we ask that the Government also consider interim  
20 PE's as well."

21 MR. SHIN: I'm Patrick Shin from Nan, Inc. I think  
22 we've been very nice about saying six months to one year. A  
23 lot of times it takes two years to close a contract. And I  
24 don't know if CA means they're too busy or the claims not  
25 closed or the punch list is not on. Usually they don't close

1 the contract right after we finish the project and the  
2 requirement was how they going -- how are you guys going to  
3 evaluate this. If we don't have a final evaluation paper,  
4 then you're not going to consider that as one of the complete  
5 project. So I think you guys have to change something around  
6 over there to fix that design criteria, I mean the evaluation  
7 criteria.

8 PANEL CHAIRMAN CABALCE: Are you providing the response  
9 to that?

10 PANEL MEMBER WON: I did.

11 PANEL CHAIRMAN CABALCE: So you want to provide the  
12 response here?

13 PANEL MEMBER HICKS: I have her written response here.  
14 Well, okay, the way this goes, you know, she's one person of  
15 a team that's preparing -- going to prepare an official  
16 response. So I have her opinions to the question with  
17 responses. And I can provide that now, but we'll have to  
18 give an official answer, an amendment via some changes or  
19 whatever to that section of the spec.

20 PANEL CHAIRMAN CABALCE: Okay, what Renee has said was  
21 that this is not the final response, this is an initial  
22 preliminary response from Dorinda. The rest of the team at  
23 the District will take a look at it, and we will issue the  
24 final response to that amendment.

25 PANEL MEMBER HICKS: One of the responses right now is



1 substantial completion need not be evidenced only by a final  
2 performance evaluation, however, there does need to be some  
3 kind of documentation from the contracting officer except in  
4 the entire contract if partial turnover will not suffice.  
5 You do not necessarily have to have the final performance  
6 evaluation, but you have to have something, some type of  
7 documentation.

8 PANEL CHAIRMAN CABALCE: Okay. Is there another  
9 question?

10 MR. YUEN: Question Number 2. "In relation to the  
11 above question, in regards to an IDIQ-type contract, would  
12 the contract be considered substantially complete for either  
13 of these two scenarios, (a) the final option year of the  
14 contract has ended, yet task orders within the contract are  
15 ongoing and dependent upon the definition of substantially  
16 complete, are not of one of the submitted task orders or, (b)  
17 majority of the contract is completed, (i.e, for example, a  
18 base and four option year contract, base year and two option  
19 years are completed.) Please define what is considered  
20 substantially complete for an IDIQ-type contract."

21 PANEL MEMBER HICKS: In response to that question, for  
22 an IDIQ contract to be considered substantially complete,  
23 both the submitted task order and the contract must meet the  
24 criteria for substantially complete, which is identified in  
25 the RFP.

1           MR. YUEN: Okay. Number 3, "in relation to Questions 1  
2           and 2, we particularly feel that a contract 50 percent  
3           complete can be evaluated just as fair as a contract that is  
4           substantially complete, as majority of the problems on -- on  
5           this project occur during the setup and initial phases of the  
6           project. In addition, would it not be more advantageous in  
7           the Government's evaluation of this RFP to award to an  
8           Offeror that is currently managing a sizable staff and an  
9           extensive workload rather than a company who performed at the  
10          same capacity but five years ago.

11                 "We feel this would be -- we feel this would be since  
12          the projects that are most current would reflect an Offeror's  
13          current management style/program which carries through to the  
14          end of the project. Additionally, the government will be  
15          able to better understand the Offeror on an ongoing project  
16          in comparison to an Offeror that is -- comparison to an  
17          Offeror that completed the project awhile ago and may have  
18          experienced a downturn in projects in the time since.

19                 "With the current requirements, the Government is  
20          eliminating current projects and, therefore, will not be  
21          getting the best value out of their evaluation. Therefore,  
22          we feel that current projects should carry the same weight as  
23          past projects, in regards to relevant experience and past  
24          performance; and that the Government should include ongoing  
25          projects in the evaluation of this RFP."

1 PANEL MEMBER HICKS: We don't have a response really  
2 prepared, but we will respond at a later time.

3 PANEL CHAIRMAN CABALCE: You understand the question,  
4 though; right?

5 PANEL MEMBER HICKS: Yeah, we understand the question.  
6 It's noted by the Government. I mean, we have to draw the  
7 line somewhere.

8 MR. SHIN: Why you guys don't have answer?

9 PANEL MEMBER HICKS: You just sent it yesterday, end of  
10 last night; right?

11 MR. SHIN: I'd like to make one comment. I guess we do  
12 a lot of design-build projects, not in the State of Hawaii, I  
13 mean other states. So it's very rare to see type about --  
14 the way you guys put it in. You guys go on and you evaluate  
15 the complete project. Because ongoing project, you can find  
16 out about the company more better than past projects. You  
17 know, so I think this ongoing project I think should be  
18 weighted equally or it should be weighted more than completed  
19 project.

20 Because ongoing projects, you can find out about the  
21 company more than the projects you finished like five years  
22 ago. So I think that's --

23 PANEL MEMBER CARLILE: We feel like we got to draw the  
24 line somewhere, but we'll take your points into consideration  
25 and review those, discuss it.

1           MR. YUEN: "Regarding the request for a Small Business  
2           Subcontracting plan from large business concerns, as this is  
3           a design-build contract, it is very difficult for an Offeror  
4           to list definite subcontractors for this project at the time  
5           of bid submittal. If an Offeror is required to list  
6           subcontractors to be used on this project, this will limit  
7           the competition to only large businesses, as most small  
8           businesses do not have the capacity to estimate a project of  
9           this size. Therefore, we ask that the Government hold the  
10          Offeror liable to the small business percentage goals  
11          presented in its plan and not necessarily the goals for a  
12          specific trade.

13                "For example, if an Offeror proposes to use a  
14          women-owned small business painting subcontractor for an X  
15          percent of the total planned subcontracting dollars; however,  
16          after award of the project, the Offeror finds that that  
17          particular subcontractor is unable to perform on this  
18          project. In this case, an Offeror should not be held liable  
19          to replace the trade of the subcontract but rather the  
20          percentage proposed for that small business subcontracting  
21          concern."

22                PANEL MEMBER HICKS: That particular question was  
23          referred over to the small business specialist who's going to  
24          review the actual subcontracting factor for this RFP, so  
25          we'll be preparing responses for that.

1           MR. YUEN: "Paragraph 2 under Paragraph 2.5.1, Relevant  
2       Contracts, page 00120-5, states, IDIQ-type contracts may be  
3       submitted only if a single task order on that contract  
4       involves at least four of the characteristics for either a  
5       construction contract or a design-build contract as  
6       applicable.

7           Therefore, we interpret this sentence to mean that if  
8       an Offeror submits an IDIQ-type contract with a contract  
9       value over \$25 million and has more than one task order that  
10      meets at least four of the specified characteristics for  
11      either a construction contract or a design-build contract,  
12      this IDIQ type contract, as a whole, will qualify in  
13      demonstrating experience in meeting Characteristic Number 1.  
14      Do you concur?"

15          PANEL MEMBER HICKS: Basically, response is the task  
16      order must meet the criteria that's set forth in the RFP.  
17      The overall value of the contract is not relevant.

18          MR. YUEN: Number 6, "suppose that an Offeror submits  
19      an IDIQ-type contract with various task orders, (task orders  
20      A, B and C) that involve at least four of the characteristics  
21      for either a construction contract or a design-build contract  
22      which are as follows: Task order A meets Characteristics 2,  
23      3, 4, 5; Task Order B meets Characteristics 4, 5, 6, 7 and  
24      Task Order C meets Characteristics 6, 7, 8, 9. In evaluating  
25      the contract, will the Offeror be evaluated as meeting

1 Characteristics number 2 through 9?"

2 PANEL MEMBER HICKS: A task order type can only be  
3 counted once. So if you submit a task order, it counts once.

4 MR. SHIN: You know, I want you guys to do one thing.  
5 When you answer this question and the previous question, I  
6 want you to read the RFP, that paragraph, how you describe  
7 the IDIQ. Because that paragraph is very tricky, and I mean  
8 we spent about six hours analyzing the paragraph. That's how  
9 much time we spent in putting these questions together. So I  
10 think you guys have to reread that paragraph very carefully  
11 when you answer these two questions.

12 PANEL MEMBER HICKS: Note taken.

13 MR. YUEN: Number 7, "we are currently working on a  
14 project at Quad F, Schofield Barracks (contract number  
15 DACA83-02-C-0001) with elements of work similar to that of  
16 this Quad C project. However, our contract did not involve  
17 ACM removal as it was performed by another contractor, R&D  
18 Technologies, on a separate contract, prior to our  
19 mobilization on the project. Therefore, as our contract  
20 price did not involve asbestos removal, would it be possible  
21 for the Government to disclose the contract amount for the  
22 work performed on R&D's contract?"

23 PANEL MEMBER HICKS: Actually, we don't have a response  
24 prepared for that and actually I would like you to further  
25 expand on your question.

1           MR. SHIN: I guess in doing the Quad F and Corps of  
2 Engineer hire separate contractor to remove the asbestos. I  
3 don't know what the exact scope. I know one of them is to  
4 remove asbestos before we get into the job site. So I'd like  
5 to know what was their contract amount for removing the  
6 asbestos for the Quad F and maybe scope of their work and  
7 their contract amount.

8           I know scope of work was -- majority of them was  
9 removing asbestos on Quad F, but I guess -- you know, I'm not  
10 the contractor for that project and I guess Corps of Engineer  
11 has the record on the contracts, what was the exact scope of  
12 work and the contract amount.

13          PANEL MEMBER HICKS: I don't know. I don't think I'm  
14 qualified to answer that question.

15          PANEL CHAIRMAN CABALCE: Whose contract was that?

16          MR. SHIN: It was R&D.

17          PANEL CHAIRMAN CABALCE: Do you know whose contract  
18 that was? It was a DPW contract. I was just asking if we  
19 knew those two individuals -- they knew who the contractor  
20 was. The answer was it was a Corps contractor. I'm not  
21 sure --

22          PANEL MEMBER HICKS: Patrick, I'm not sure, why is that  
23 relevant to this solicitation? That's the question we have.

24          MR. SHIN: Because I guess I'd like to know what was  
25 the contract amount to remove that asbestos because it wasn't

1 my scope of work, so I'd like to know what their number was.

2 PANEL MEMBER HICKS: If that has to do with a different  
3 solicitation, why does it have to do with -- we're here for  
4 this Quad C project.

5 MR. SHIN: I got to know the prices so I can apply to  
6 Quad C.

7 PANEL CHAIRMAN CABALCE: We're going to have to answer  
8 that later.

9 MR. SHIN: And the funny thing is that Quad F, it was  
10 on the newspaper today, exposed to the asbestos because the  
11 soldiers when they're there think that they're doing their  
12 own renovation, and they had to -- another asbestos company  
13 when there is emergency work, so they remove so much  
14 percentage of the asbestos. And I guess I didn't put that in  
15 the question.

16 So when R&D went there, there was some asbestos removed  
17 already. So if we can find out the emergency work, what was  
18 the contract amount, too, then that way we have the accurate  
19 number to shoot for.

20 MR. KUMABE: Mike Kumabe. The emergency contract --

21 PANEL CHAIRMAN CABALCE: I think we can prepare a  
22 response to that, Mike.

23 MR. KUMABE: Do you want me to respond or not?

24 PANEL MEMBER HICKS: We'll have to prepare a response.

25 MR. SHIN: Do you want me to add to the form on the  
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1 writing, my second question, quad emergency work?

2 PANEL MEMBER HICKS: Yes, please. One more question.

3 MR. YUEN: "In relation to the above-mentioned question  
4 and project, our proposal did not include consideration of  
5 AT/FP requirements. Would the Government disclose the  
6 Government's estimated amount as well as the Offeror's option  
7 amount?"

8 PANEL MEMBER HICKS: We don't have a response to that  
9 either. Is that something that you want to expand upon also?

10 MR. SHIN: Quad F, our contract wasn't including  
11 anti-terrorism requirement. And if the Government has -- I  
12 know the Government has estimate for Quad F, what was the  
13 Government's estimate in their requirement?

14 PANEL MEMBER HICKS: We'll prepare a response to that.

15 PANEL CHAIRMAN CABALCE: We'll have to look at that.

16 PANEL MEMBER HICKS: But that's one of the questions  
17 that we have.

18 PANEL CHAIRMAN CABALCE: Do anyone else have questions  
19 written out that we can start addressing?

20 MR. OSBORNE: When reference is made to Quad F,  
21 example, gear wash design, gymnasium design solutions, are  
22 you going to issue them to the other contractors who are  
23 bidding the project?

24 PANEL MEMBER KAI: Gymnasium design?

25 MR. OSBORNE: There was -- one of the references is

1       that we should follow the design --

2               PANEL MEMBER KAI:   Yeah, the gear wash drawings were in  
3       an attachment so it had the wall sections, roof sections,  
4       everything was in the design.   It's in one of the  
5       attachments.

6               MR. OSBORNE:   And they would be signed like for the  
7       gymnasium?

8               PANEL MEMBER KAI:   Oh, the gymnasium, there's no  
9       particular design.   It's a refurbish and you have to maintain  
10      the historical elements within the gymnasium.   There's no  
11      real particulars.   It's just refurbishing, refinishing  
12      floors, painting, retaining historic elements, redoing the  
13      seismic walls, shear walls and that sort of nature.

14              MR. SHIN:   That's not I think right answer.   Quad F has  
15      to do some seismic upgrade and it has to provide a sprinkler.

16              PANEL CHAIRMAN CABALCE:   In the gym?

17              PANEL MEMBER KAI:   That might be also.   But I thought  
18      his question was particular to design plan.

19              MR. OSBORNE:   The gymnasium.

20              PANEL MEMBER KAI:   I'm sure there's an  
21      electrical-mechanical upgrade. I'm not speaking to that.   He  
22      asked about plan design.

23              MR. OSBORNE:   You have here -- going on what Patrick  
24      was saying.   It talked about wall thickening below the  
25      molding which strengthen the wall from the outside,

1 recommended reference to Quad F solution for this challenge.  
2 That's a quote from your RFP document that's recommending us  
3 to follow a design solution that was achieved on Quad F.

4 PANEL MEMBER KAI: Does that sound familiar -- that  
5 sounds like a structural --

6 MR. MCVEIGH: We'll have to research that later.

7 PANEL CHAIRMAN CABALCE: Do you have any questions?  
8 Does he have a reference of a paragraph?

9 MS. MURISON: 15-11.

10 MR. OSBORNE: Second question. Will the original  
11 drawings and photos for Quad C be provided to the contractor?

12 PANEL CHAIRMAN CABALCE: Are you talking as-builts?

13 MR. OSBORNE: Original drawings, photos and as-builts.

14 PANEL MEMBER KAI: As-built drawings will be issued in  
15 the amendment, the upcoming amendment. And photos, I'm not  
16 sure about photos.

17 PANEL CHAIRMAN CABALCE: Okay, I want to clarify that.  
18 Are we talking about the as-builts the -- actually --

19 PANEL MEMBER KAI: He asked about photos, as-builts and  
20 drawings. We're giving him as-built drawings.

21 MR. OSBORNE: And the reason I say that is you  
22 reference in your drawings the original detail at the eaves  
23 which follows photos and the original drawings. 15-A.

24 MR. MCVEIGH: Is that the historic section?

25 MR. OSBORNE: Yes.

1 PANEL CHAIRMAN CABALCE: We're going to have to take  
2 that back and come back with a response to that.

3 PANEL MEMBER KAI: I know the drawings have a profile  
4 of eaves, a set of architectural drawings, a detail profile  
5 of the eaves. So to that extent, we have to follow that.

6 MR. OSBORNE: I'll give you these questions at the end  
7 anyway.

8 Another question, do we need to conform to the life  
9 safety code NFPA 101? When existing floor transitions is  
10 greater than one inch, do we need to fill the adjacent floor  
11 to meet the requirements?

12 PANEL CHAIRMAN CABALCE: We're going to have to take  
13 that back and provide a response later.

14 MR. OSBORNE: Another one is, can we submit the small  
15 business plan the following day at 10:00 a.m? So the day  
16 after the bid closes, can we submit the small business plan  
17 the day after?

18 PANEL MEMBER HICKS: No. I think the requirement in  
19 the -- is due the day of -- the rest of the RFP is due the  
20 day the rest of the proposal is due.

21 MR. OSBORNE: The question we're asking is, can we  
22 submit it the following morning?

23 PANEL MEMBER HICKS: Are you asking for an extension?

24 MR. OSBORNE: For the small business plan only.

25 PANEL MEMBER HICKS: It should be on August 4th.

1 MR. OSBORNE: The reason we raise that is at a recent  
2 small business -- put on by the Corps and the Navy, that they  
3 were looking into recommending that true to the contracting  
4 side. That's when your small business -- to give us an  
5 opportunity to prepare our small business plans.

6 PANEL MEMBER HICKS: Well, I can check with the small  
7 business person and get back with you.

8 MR. OSBORNE: All -- actually the rest of these  
9 questions were submitted by us yesterday.

10 PANEL MEMBER HICKS: To who?

11 MR. OSBORNE: Your office.

12 PANEL MEMBER HICKS: Directly to me, myself?

13 PANEL CHAIRMAN CABALCE: I think you faxed it to me,  
14 but I didn't get it. It's in my office. You submitted it  
15 late.

16 MR. OSBORNE: Do you want me to go through it?

17 PANEL CHAIRMAN CABALCE: Yeah, go through it.

18 MR. OSBORNE: Can you provide us with the following to  
19 be used in preparing our bid proposal RFP bid design  
20 drawings? Plans of existing conditions of the building to be  
21 renovated, selective demolition plans of the renovated  
22 buildings.

23 PANEL CHAIRMAN CABALCE: We're going to have to take  
24 that back and provide a response.

25 MR. OSBORNE: Can we replace the specified material to  
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1 a renewable material, i.e, VCT versus linoleum?

2 PANEL CHAIRMAN CABALCE: We're going to have to take it  
3 back --

4 MR. OSBORNE: That implies into the sustainable design,  
5 that question.

6 Can you provide the RFP facility spirit rating sheet  
7 for the RFP?

8 PANEL MEMBER KAI: Spirit rating sheet?

9 PANEL CHAIRMAN CABALCE: The completed one.

10 MR. OSBORNE: Your design we assume is designed to a  
11 silver level.

12 PANEL MEMBER KAI: You want to see how they achieve  
13 that rate?

14 MR. OSBORNE: Can you provide us your rating sheet?

15 PANEL CHAIRMAN CABALCE: Yes, we will, in an amendment.

16 MR. OSBORNE: The last question is can we postpone the  
17 bid closing day?

18 PANEL CHAIRMAN CABALCE: We'll take that into  
19 consideration. We're going to have to issue an amendment.  
20 After the amendment is issued, we'll allow adequate time for  
21 the people to submit their proposals. Is there any more  
22 questions?

23 MR. YUEN: Walter Yuen, Nan Inc. The RFP documents  
24 include Attachment 15, proposal data sheet. This form  
25 indicates that this is to be provided at the beginning of the

1 Offeror's proposal. However, it is not referenced anywhere  
2 else in the RFP documents. Is this attachment required for  
3 proposal submission?

4 PANEL MEMBER HICKS: We'll have to look into it. What  
5 reference is that?

6 MR. YUEN: Attachment 15.

7 PANEL CHAIRMAN CABALCE: We're going to have to take a  
8 look at that and provide a response.

9 MR. YUEN: "In the statement of work Chapter 6,  
10 structural design within paragraph 6.5.5 on page SOW 6-4 of  
11 the RFP referencing AT/FP, one paragraph mentions the  
12 requirement to design and retrofit existing floor slabs (with  
13 FRP or similar top slab reinforcing) to withstand upward  
14 blast loads as given by paragraph B-2.1.3 of UFC-4-101-01  
15 shall be treated as a bid option to this project... However,  
16 Section 00010 proposal schedule does not reflect this option.  
17 Please review and clarify."

18 PANEL CHAIRMAN CABALCE: Okay, we will. We will  
19 clarify that. Any more questions at this time? Do you have  
20 a question?

21 MR. PATTERSON: I have a couple. Bruce Patterson,  
22 Hawaii Dredging. In the SOW 5-1 and then SOW 14-1 there's a  
23 reference to interior furniture. One says the Government  
24 will furnish and install. One says the government will  
25 furnish and the contractor install. So I was just curious as

1 if I'm reading that right?

2 PANEL MEMBER KAI: That's correct. In SOW Chapter 2 it  
3 details what is contractor-installed and what is  
4 Government-installed?

5 MR. PATTERSON: Second question. It does say that the  
6 funds are not appropriated for this. Do we have a time line  
7 on when funds might be appropriated for this project?

8 PANEL CHAIRMAN CABALCE: Where does it say that?

9 PANEL MEMBER HICKS: We can take a look at that.

10 MR. PATTERSON: It's on the very bottom on this main  
11 table of contents, request for proposal.

12 PANEL CHAIRMAN CABALCE: It's not accurate, though.  
13 The concept -- Article MCA states funds have been  
14 appropriated.

15 MR. PATTERSON: Are there going to be additional  
16 opportunities for walk-through on this project before bid  
17 day?

18 PANEL CHAIRMAN CABALCE: Okay. We're going to have to  
19 take a look at that. Can we have a consent? You're speaking  
20 for Hawaii Dredging in general?

21 MR. PATTERSON: I was just thinking as subs were  
22 contacted to work on it, they might want to come out and  
23 look. Some subcontractors might want to.

24 PANEL CHAIRMAN CABALCE: I'm going to have to take that  
25 back and ask some of our people if we can support that.



1           MR. PATTERSON: The surrounding areas of the Quad C,  
2           what's going to be made available to contractors for use  
3           of storage?

4           PANEL CHAIRMAN CABALCE: Contractor storage. Okay,  
5           we're going to have to take that back and take a look at  
6           that.

7           MR. PATTERSON: And was there -- there was a reference  
8           on drawing sheet T-3 to this department of Army Facilities  
9           Standardization Program, standard company operation facility,  
10          February 1994, that we're supposed to comply with. And I'm  
11          just curious is there a copy of that available?

12          PANEL MEMBER KAI: Yes, it can be.

13          PANEL CHAIRMAN CABALCE: We'll provide a response to  
14          that. Are we going to issue a copy?

15          PANEL MEMBER KAI: Issue a copy.

16          PANEL CHAIRMAN CABALCE: Is it an attachment?

17          PANEL MEMBER KAI: On one of those sheets, a T-3, it  
18          listed a matrix of all square footages, and it explained --  
19          the AE put those square footages that he's telling you where  
20          they got it from. So to that extent, that's all that  
21          reference means. It doesn't mean anything more than just  
22          those square footages listed on T-3, that's all.

23          PANEL CHAIRMAN CABALCE: Is there any more questions?

24          MR. OSHIRO: Couple of mechanical questions. RFP  
25          Mandates low ozone depleting refrigerants. Is that defined

1 as R-22, R-134a or R-123 or is it zero ozone depleting  
2 potential which is just R-134a?

3 PANEL MEMBER CHUN: I'll get back to you.

4 MR. OSHIRO: Second question. The RFP called for  
5 bacnet compatible DDC controls to be interfaced with other  
6 systems. Does that preclude any other DDC system that uses a  
7 different interface or are gateways allowed?

8 PANEL CHAIRMAN CABALCE: You or Tom?

9 PANEL MEMBER CHUN: No, I'll respond to that. Because  
10 Lon Works is getting more popular. We intended the system to  
11 be bacnet compatible. And I'll provide a official response  
12 later.

13 MR. OSHIRO: There are no efficiencies mentioned in any  
14 of the documentation that I could see for the equipment, the  
15 chillers, the pumps or anything like that.

16 So I was wondering do we go right down to the very  
17 lowest number that we can get or is there a range, I mean,  
18 because there is a cost difference, a significant cost  
19 difference when you start getting to the higher efficiency  
20 equipment?

21 And we don't want to pick a reasonable number and then  
22 later on in the course of, well, I want you to get right down  
23 to the most efficient thing you can find on the market which  
24 is a big cost difference. So there's going to be a schedule  
25 of efficient -- what kind of equipment efficiency were you

1 looking for?

2 PANEL MEMBER CHUN: I'll respond to that later.

3 MR. OSHIRO: Last question. The RFP calls for constant  
4 volume system on the chill water system. The energy  
5 efficiency system section calls for the most efficient system  
6 that we can design, it's a design requirement. A constant  
7 volume is not the most efficient system that we can deal  
8 with. There's variable primary systems, there are primary  
9 secondary systems. There are other systems that can -- so I  
10 was just wondering what controls -- the RFP control, the  
11 mechanical or the energy conservation?

12 PANEL MEMBER CHUN: I'll respond to that later, but  
13 what we intended on the concept design was to provide a  
14 constant volume system, but I understand the question. So  
15 I'll respond to that later.

16 PANEL CHAIRMAN CABALCE: You're going to turn in your  
17 written questions. In the back.

18 MR. BURIAN: Jack Burian, I'm with Notkin Hawaii. Will  
19 the base building design and calculations for HVAC be made  
20 available for base spirit rating?

21 PANEL MEMBER CHUN: There are some calculations in the  
22 RFP document, and I understand what we were discussing later  
23 on a previous question that we would be providing the spirit  
24 rating as an attachment.

25 MR. BURIAN: Okay.

1           PANEL CHAIRMAN CABALCE: Any more questions? Okay,  
2           those of you that did ask questions that haven't turned in  
3           your written questions, could you please turn it in before  
4           you leave. Also if you can before you leave, just sign your  
5           name and fill in this sign-in sheet.

6           Again, I will take all these questions, we will be  
7           issuing -- right now we have a separate -- we have plan to  
8           issue an amendment in a couple of days. That amendment is  
9           coming out to clean up some of the design. And about a week  
10          later we plan to issue an amendment responding to the  
11          questions that were asked at this proposal conference.

12          MR. MCVEIGH: That will be amendment 2 that's going to  
13          be issued.

14          PANEL CHAIRMAN CABALCE: If we don't get another  
15          amendment in between.

16          PANEL MEMBER KAI: There's just one out now.

17          PANEL MEMBER HICKS: Clarification. There's no  
18          amendments now to this.

19          PANEL CHAIRMAN CABALCE: Just for your information, you  
20          know, we'd like to award this project before 30 September.  
21          If you could, if you have questions, please ask your  
22          questions early so we can have sufficient time to respond to  
23          those questions. That's all. Again, turn in your questions  
24          for those who asked questions. Before people leave, please  
25          sign in.

1           (Whereupon, at 1:50 p.m., the hearing in the  
2       above-entitled matter was closed.)

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## C E R T I F I C A T E

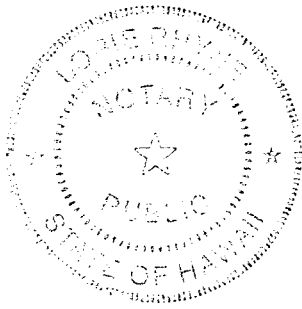
I, Lorie Rhyne, C.S.R., in and for the State of Hawaii,  
of Hawaii, do hereby certify:

That I was acting as shorthand reporter in the foregoing  
matter on the 15 day of July 2003;

That the proceedings were taken down in computerized  
machine shorthand by me and were thereafter reduced to print  
under my supervision; that the foregoing represents, to the  
best of my ability, a correct transcript of the proceedings  
had in the foregoing matter;

I further certify that I am not counsel for any of the  
parties hereto, nor in any way interested in the outcome of  
the cause named in the caption.

Dated: July 17, 2003



Lorie Rhyne  
Lorie Rhyne, C.S.R. 444  
Certified Shorthand Reporter  
Commission expires:  
April 27, 2007

Site Visit  
 DACA83-03-R-0013, FY03 MCA/BUP PN52068/69,  
 WBR Brigade Complex Ph 3A (Quad C), Schofield Barracks  
 15 July 2003  
 Quad C, Schofield Barracks

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## Quad C, Schofield Barracks

RHS LEE, 455-9026

**RFP NO. DACA83-03-R-0013**  
**WBR, QUAD C, SB, HI**

[illegible]

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WBR, BRIGADE COMPLEX,  
PHASE 3A, QUAD C

Statement of Work

16 June 2003

FY03 MCA PN 52068 & BUP 52069  
WHOLE BARRACKS RENEWAL  
BRIGADE COMPLEX, PHASE 3A, QUAD C

## **STATEMENT OF WORK**

16 June 2003

U.S. ARMY CORPS OF ENGINEERS  
Honolulu Engineer District

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**ATTACHMENTS:**

<u>No.</u>	<u>DESCRIPTION</u>
1	SIGN TYPES
2	WATER ANALYSIS
3	PLUMBING AND HVAC DESIGN ANALYSIS
4	COOLING LOAD CALCULATIONS, VAC EQUIPMENT SELECTION, PLUMBING CALCULATIONS, PLUMBING EQUIPMENT SELECTION, AND CENTRAL MECHANICAL PLANT
5	FIRE PROTECTION DESIGN ANALYSIS AND CALCULATIONS
6	FIRE ALARM SEQUENCE OF OPERATION MATRIX
7	EXCAVATION PERMIT
8	LANDSCAPE DESIGN ANALYSIS
9	BLAST AND PROGRESSIVE COLLAPSE VULNERABILITY ASSESSMENT
10	SEISMIC EVALUATION AND REHABILITATION REPORT
11	FOOD SERVICE DESIGN ANALYSIS
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14	RFP LIST OF DRAWINGS
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25. GEAR WASH/RECREATION BUILDING
26. PRELIMINARY SOILS REPORT
27. GTB DETAILS
28. QUAD C RFP INFORMATION DRAWINGS
29. PROGRESSIVE COLLAPSE VULNERABILITY ASSESSMENT
30. CONCEPT DESIGN ANALYSIS OF EXISTING STRUCTURAL SYSTEM
31. CONTRACTOR OPERATIONS AND STORAGE AREA

## CHAPTER 2

### FUNCTIONAL AND AREA REQUIREMENTS

#### 2-1 GENERAL REQUIREMENTS

2-1.1 **Building Functionality.** Functional spaces depicted on the RFP Concept Design Drawings have been coordinated with the proper contacts and have been sized and arranged for efficient use and circulation. The Design Build offerors shall incorporate the RFP Concept Architectural Design into their design proposal. The floor plan layout and relationship of functional spaces depicted in the architectural floor plans shall not be deviated from. All architectural criteria must be met and accounted for, see paragraph 5-2 Applicable Codes and Standards. Any changes shall be brought to the attention of the Contracting Officer for resolution in writing.

2-1.2 **Gross building area definition.** Gross building area is measured to the outside face of exterior enclosure walls. Gross area includes floor areas, penthouses, mezzanines, and other spaces as follows:

2-1.2.1 **Areas calculated as half space.** Gross area includes one-half the area of exterior covered areas such as balconies, entries, loading platforms, breezeways, exterior corridors, and porches. Exterior covered areas are measured from the face of the enclosure wall to the edge of the covered area served. Open Stairs count as half space for each floor they serve.

2-1.2.2 **Excluded space.** The following spaces are excluded from gross area calculations: Attic areas where average clear height does not exceed 2.13m [7 feet]; crawl spaces; exterior uncovered loading platforms; open courtyards; normal roof overhangs and soffits for weather protection; uncovered ramps and steps; utility tunnels; raceways; mechanical equipment platforms and catwalks.

2-1.3 **Gross area limitations.** Refer to RFP Concept Design Drawings for gross building area limitations for this RFP. Proposals shall not exceed authorized gross area limitations.

2-1.4 **Net area definition.** Net area is measured to the inside face of the room or space walls.

2-1.5 **Net Area Requirements.** Refer to RFP Concept Design Drawings for net area requirements for programmed spaces included in this chapter. The space is sized to accommodate the required function, comply with code requirements, and other requirements of the RFP.

2-1.6 **Finish Requirements.** Room finishes stated in the following paragraphs are minimums.

2-1.7 **Furniture Requirements.** The offeror is required to work with the customer to develop a Comprehensive Interior Design Package (CID) for all Quad C Buildings. Refer to SOW Chapter 14 for CID requirements. A Furnishings/Fixtures/Equipment (FF&E) paragraph description has been provided for each space for each Quad C Building, (i.e. paragraphs 2-2.1.1.2, 2-2.1.2.2, 2-2.1.3.2, etc...). These paragraphs determine which items are Government furnished and installed or Contractor furnished and installed. The offeror is required to work with the customer to determine specific furniture criteria such as acceptable materials, finishes and quality levels. The number and location of furnishings serve as an indicator of the number of power, data and communications connection points. See electrical section for more detail. The Furnishings described in the FFE paragraph for all spaces in Chapter 2 are for information only and is a starting point for the CID discussion purposes between the customer and the successful offeror.

2-1.7.1 The offeror is not required to purchase the Furnishings (tables, chairs, sofa, bed, etc.) for the programmed spaces unless noted otherwise. Also, the offeror is not required to provide equipment that is not installed (refrigerator, microwave, washer, and dryer).

**2-2 BUILDING 355 - COMPANY OPERATIONS FACILITIES FUNCTIONAL AND AREA**

**REQUIREMENTS.** RFP Concept Design Drawings is separate and is included with this Specification Manual to describe the complete scope of work for this project. The company operations facilities (COF) building(s) shall consist of administrative areas, heavy equipment storage and light equipment storage for each company, support spaces, and common locker/shower facilities. Building 355 contains the Heavy Equipment storage for four medium and one large Company Operations Facilities (COF) and one COF Toilet/Shower located on the first floor. COF Administration Offices and Classrooms for three medium COFs and one COF Toilet/Shower will occupy the second floor. COF Administration Offices and Classrooms for one medium COF and one large COF and one Toilet/Shower will occupy the third floor. COF functions and areas that occur in Building 355 shall be as follows:

**2-2.1 COF Administrative Areas.** Provide one group of administrative areas per company. Company leadership will manage the organization, receive visitors, and conduct day-to-day business from the COF administrative areas. Entrance shall be separate and distinct from the entrances to company light equipment storage areas and to COF administrative areas. Each COF Administrative area shall be provided with a Company Identification Sign (5 total) see paragraph 5-8.2.6. Military personnel will staff the facility. Provide the following areas for each company:

**2-2.1.1 Company Commander (CO).** Provide one per company located on the second and third floors. Room shall be accessed through the Admin Office. Occupants: 1, and occasional visitors.

**2-2.1.1.1** Function: Private office for commanding officer.

**2-2.1.1.2** Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: one desk with return, one credenza, one bookcase, two legal-size four-drawer file cabinets, one conference table, four side chairs, and one desk chair.

**2-2.1.1.3** Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

**2-2.1.1.4** Other requirements: Provide 914 mm 3'-0" wide door into room. Room shall have exterior window.

**2-2.1.2 Executive Officer (XO).** Provide one per company located on the second and third floors. Room shall be accessed through the Admin Office. Occupants: 1, and occasional visitors.

**2-2.1.2.1** Function: Private office for the company executive officer.

**2-2.1.2.2** Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair and one desk chair.

**2-2.1.2.3** Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

**2-2.1.2.4** Other requirements: Provide 914 mm 3'-0" wide door into room. Room shall have exterior window.

**2-2.1.3 First Sergeant (1 SG).** Provide one per company located on the second and third floors.

Room shall be accessed through the Admin Office. Occupants: 1, and occasional visitors.

2-2.1.3.1 Function: Private office for the company first sergeant (highest ranking non-commissioned officer).

2-2.1.3.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, two side chairs and one desk chair.

2-2.1.3.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.3.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-2.1.4 **Training Officer (TNG).** Provide one per company located on the second and third floors. Room shall be accessed through the Admin Office. Occupants: 1, and occasional visitors.

2-2.1.4.1 Function: Private office for the company Training Officer.

2-2.1.4.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, two side chairs and one desk chair.

2-2.1.4.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.4.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Exterior window is desirable.

2-2.1.5 **Admin Office (ADMIN OFF).** Provide one per company located on the second and third floors, including interior circulation. Room shall be accessed through the Waiting Area. Occupants: 2 clerks, and occasional visitors.

2-2.1.5.1 Function: Office for company administrative clerks, storage of files, access to private offices. Clerks will have visual control of waiting area and conference room door.

2-2.1.5.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: two clerk desks with returns and desk chairs. The following items will be Contractor furnished and installed: reception desk (built-in casework), as indicated on the concept design drawings separating the Admin Office from the Waiting Area. The counter on the Waiting Area side shall be 1016 mm high x 305 mm deep. Admin side of reception desk shall be at desk height, and shall accommodate computer and monitor (not in contract), and writing area. Provide task lighting at all writing surfaces. Provide built-in communication and power receptacles or grommets in desk top to access wall receptacles. Desk shall have knee space and minimum two cabinets with hinged doors, and two drawers. Drawers and cabinets shall have keyed locks. Desk components shall have plastic laminate countertop, drawer, and door fronts. Provide a floor anchor for one GFGI security safe. Coordinate anchor location with furniture layout; refer to paragraph 5-7.2.8.

2-2.1.5.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.5.4 Other requirements: Provide 914 mm [3'-0"] wide entry door into room from Waiting Area.

2-2.1.6 **Administrative Area Corridor.** Circulation to building spaces shall comply with applicable code egress requirements. Unless otherwise required, administrative area corridor shall be capable of being secured from exterior entrances and from any adjacent public, unsecure corridors.

2-2.1.6.1 Function: Circulation and means of egress.

2-2.1.6.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: one handicap accessible electric water cooler; fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-2.1.6.3 Finishes:

Floor: vinyl composition tile.

Base: resilient cove base.

Walls: impact resistant gypsum wallboard with painted finish.

Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.7 **Waiting Area (WAIT).** Provide one per company located area on the second and third floor, incorporated into the Administrative Area Corridor. Occupants: Two or more visitors; additional visitors (e.g. those waiting to attend a large meeting in the conference room) will wait in the adjacent corridor.

2-2.1.7.1 Function: Waiting and reception area for company soldiers and visitors. Control point for access to admin office and conference room.

2-2.1.7.2 Furnishings/Fixtures/Equipment (FFE): the following items will be government furnished and installed: two side chairs; one 1219 mm high x 1829 mm wide [4'-0" x 6'-0"] wall mounted bulletin board.

2-2.1.7.3 Finishes: Match Administrative Area Corridor.

2-2.1.8 **Platoon Office (PLT).** Provide four platoon offices per company located on the second and third floors as depicted on the RFP Concept Design Drawings. Offices shall be accessed directly from the Administrative Area Corridor, or through a common space that is accessed from the Administrative Area Corridor. Occupants: 1 in each office, and occasional visitors.

2-2.1.8.1 Function: Private office for platoon leaders or other administrators.

2-2.1.8.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: one desk with return, one side chair and one desk chair.

2-2.1.8.3 Finishes:

Floor: vinyl composition tile

Base: resilient cove base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.8.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-2.1.9 **Platoon Open Office (PLT OPEN OFF).** Provide one per company located on the second and third floors, including interior circulation. Room shall be accessed through the Waiting Area. Occupants: 2 clerks, and occasional visitors.

2-2.1.9.1 Function: Office for platoon administrative clerks, storage of files, access to private offices. Clerks will have visual control of waiting area.

2-2.1.9.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: two clerk desks with returns and desk chairs.

2-2.1.9.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.9.4 Other requirements: Provide 914 mm [3'-0"] wide entry door into room from Waiting Area.

2-2.1.10 **Conference Room (CONF RM).** Provide one per company located on the second and third floors. Room shall be accessed from the Waiting Area (preferable), or through the Admin Office. Admin clerks shall have visual control of Conference Room door. Occupants: up to 22 persons.

2-2.1.10.1 Function: Conference room for company leadership, staff, and visitors. Functions will include staff meetings, hearings, disciplinary sessions, training.

2-2.1.10.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: tables and chairs for minimum 22 people; one marker board (minimum 2438 mm wide x 1219 mm high [8'-0" x 4'-0"]) and one 2438 mm wide [8'-0"]. The following item will be Contractor furnished and installed: recessed ceiling mounted, motorized projection screen; 2438 mm wide [8'-0"].

2-2.1.10.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.10.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-2.1.11 **Conference Room Storage (ST).** Provide one per company located on the second and third floors. Room shall be accessed from the Conference Room.

2-2.1.11.1 Function: Closet for storage of folding tables, display easels, etc.

2-2.1.11.2 Furnishings/Fixtures/Equipment:

2-2.1.11.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.11.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-2.1.12 **Toilet (TOI).** Provide two private unisex toilet rooms per company located on the second and

third floor COF Administration area. Room shall be sized to comply with handicap accessibility requirements. Room shall be accessed from Administrative Area Corridor.

2-2.1.12.1 Function: Unisex single-occupant toilet, lavatory, and shower; for use by staff and visitors.

2-2.1.12.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: one floor mounted toilet, one wall-hung lavatory, mirror with shelf above lavatory, paper towel dispenser/waste receptacle, soap dispenser, toilet tissue dispenser, one toilet seat cover dispenser; and one ceramic tile shower enclosures and shower fixture and fittings.

2-2.1.12.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile wainscot 1219 mm high with painted water-resistant gypsum board above.

Ceiling: painted gypsum wallboard.

2-2.1.12.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-2.1.13 **Janitor Closet (JAN).** Provide one per company located on the second and third floors. Room shall be accessed from Administrative Area Corridor.

2-2.1.13.1 Function: Service sink and storage of cleaning supplies, soap, and paper products.

2-2.1.13.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: one floor mounted mop sink, mop rack for three mops, and minimum 1524 linear mm of wall mounted stainless steel shelving.

2-2.1.13.3 Finishes:

Floor: vinyl composition tile

Base: resilient cove base

Walls: painted water-resistant gypsum wallboard.

Ceiling: painted gypsum wallboard

2-2.1.13.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-2.1.14 **Administration Storage (ST).** Provide one per company located on the second and third floors. Room shall be accessed from the Administration area.

2-2.1.14.1 Function storage for folding tables, display easels, etc.

2-2.1.14.2 Furnishings/Fixtures/Equipment:

2-2.1.14.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.14.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-2.2 **COF HEAVY EQUIPMENT STORAGE AREAS.** Provide one group of Heavy Equipment Storage areas per company consisting of Equipment Maintenance Area, Arms Vault, and Unit Storage. COF Heavy Equipment Storage Areas are required for four medium and one large Company Operations Facilities (COF).



COF Heavy Equipment Storage areas will be used to store, clean, and repair company operational equipment and weapons. Main entrance to Heavy Equipment Storage areas will be from paved service area inside the Quad; service area will be used for loading company equipment on and off of large trucks. Entrance shall be separate and distinct from the entrances to company administrative areas and to other COF Light Equipment Storage areas. Each COF Heavy Equipment Storage Area shall be provided with a Company Identification Sign (5 total), see para. 5-8.2.6. The sign will be located at the exterior wall space adjacent to the entrance. Only able-bodied military personnel will occupy COF supply areas; handicapped accessibility is not required. Heavy equipment storage areas for the COFs will have full height CMU. Provide the following areas for each company:

2-2.2.1 **Equipment Maintenance Area (EQUIP MAIN).** Provide one for each company area on the first floor.

2-2.2.1.1 Function: Equipment cleaning, repair and access to COF storage spaces.

2-2.2.1.2 Furnishings/Fixtures/Equipment: The following items will be Contractor furnished and installed: stainless steel equipment cleaning sinks 711 mm x 711 mm x 172 mm deep [28" x 28" x 6 ¾"], (three sinks for large and medium companies), locate near exterior doors. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-2.2.1.3 Finishes:

Floor: sealed concrete

Base: none

Walls: painted concrete, or painted concrete masonry unit walls separating COF heavy storage areas.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.2.1.4 Other requirements: All entry doors into Equipment Maintenance Area shall have auxiliary deadlocks (thumb turn inside, keyed cylinder outside).

2-2.2.2 **Arms Vault (ARMS VAULT).** Provide one Arms Vault for each company on the first floor. Construction of Arms Vault shall comply with paragraph 5-7.2. Coordinate with the authority having jurisdiction for specific construction requirements.

2-2.2.2.1 Function: Storage and issue of weapons.

2-2.2.2.2 Furnishings/Fixtures/Equipment: The following items will be Contractor furnished and installed: arms rack anchor rings on all walls inside Arms Vault; refer to paragraph 5-7.2. Arms racks are not in contract.

2-2.2.2.3 Finishes:

Floor: sealed concrete

Base: none.

Walls: painted concrete, or painted concrete masonry units.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.2.2.4 Other requirements: requirement for dehumidifier.

2-2.2.3 **Unit Storage (UNIT ST).** Provide one Unit Storage for each company on the first floor. Provide access from Equipment Maintenance.

2-2.2.3.1 Function: Storage of miscellaneous equipment.

2-2.2.3.2 Furnishings/Fixtures/Equipment: None.

2-2.2.3.3 Finishes:

Floor: sealed concrete

Base: none

Walls: Provide painted concrete masonry units.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.2.3.4 Other requirements: Provide a pair of 914 mm wide hollow metal doors. Doors shall have hold open devices with auxiliary deadlocks (thumb turn inside, keyed cylinder outside). Provide historic doors as required. Provide 914 mm [3'-0"] wide swinging door with keyed cylinder lock in wire mesh partition at Equipment Storage.

2-2.3 **COF LIGHT EQUIPMENT STORAGE AREAS.** Provide one group of Light Equipment Storage areas per company consisting of General Storage, NBC Storage, Comm Storage, Fire Control Storage, and TA-50 Gear Storage. COF Light Equipment Storage Areas are required for four medium and one large Company Operations Facilities (COF). Individual TA-50 gear lockers shall be provided: minimum 80 lockers for large COF and 60 lockers for each Medium COF. Each COF Light Equipment storage shall be provided with a Company Identification Sign (5 total), see para. 5-8.2.6. Military personnel will staff the facility. Provide the following areas for each company.

2-2.3.1 **General Storage (GEN ST).** Provide one General Storage for each company located on the second and third floor.

2-2.3.1.1 Function: Storage of soldier and miscellaneous equipment.

2-2.3.1.2 Furnishings/Fixtures/Equipment: None

2-2.3.1.3 Finishes:

Floor: sealed concrete

Base: resilient base

Walls: Provide painted impact resistant gypsum wallboard,

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.1.4 Other requirements: Provide 914 mm [3'-0"] wide hollow metal door.

2-2.3.2 **Nuclear, Biological and Chemical Equipment Storage (NBC).** Provide one NBC Storage for each company on the second and third floor.

2-2.3.2.1 Function: Storage of equipment for use in defense of nuclear, biological or chemical warfare.

2-2.3.2.2 Furnishings/Fixtures/Equipment: None.

2-2.3.2.3 Finishes:

Floor: sealed concrete

Base: resilient base

Walls: painted gypsum wallboard.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.2.4 Other requirements: Provide 914 mm [3'-0"] wide hollow metal door. The walls, doors, floors and ceiling must be constructed to meet Risk Level I requirements as specified in AR 190-51, Appendix B.

2-2.3.3 **Communications Storage (COM ST).** Provide one Communications Storage for each company on the second and third floor.

2-2.3.3.1 Function: Storage of radios and communications field gear.

#### 2-2.3.3.2 Furnishings/Fixtures/Equipment:

##### 2-2.3.3.3 Finishes:

Floor: sealed concrete

Base: resilient base

Walls: painted gypsum wallboard.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.3.4 Other requirements: Provide 914 mm [3'-0"] wide hollow metal door. The walls, doors, floors and ceiling must be constructed to meet Risk Level II requirements as specified in AR 190-51, Appendix B.

2-2.3.4 **TA-50 Storage (TA-50).** Provide one TA-50 Storage for each company located on the second and third floor. Size and configure area to accommodate as many TA-50 locker units per company (allow minimum 2438 mm [8'-0"] clearance between parallel rows of lockers; minimum 914 mm [3'-0"] between open locker doors and obstructions). These quantities shall be verified with the Company Commanders.

2-2.3.4.1 Function: Gear lockers for storage of individual soldier's TA-50 field gear.

2-2.3.4.2 Furnishings/Fixtures/Equipment: The following items will be Contractor furnished and installed: TA-50 gear lockers; lockers size: minimum 559 mm (w) x 914 mm (d) x 1067 mm (h) [22"w x 36"d x 42"h]. Lockers shall be stacked two high.

##### 2-2.3.4.3 Finishes:

Floor: sealed concrete

Base: resilient base.

Walls: impact resistant gypsum board wallboard separating TA-50 Storage from adjacent COF spaces.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.4.4 Other requirements: Provide a pair of 914 mm [3'-0"] wide hollow metal doors.

2-2.3.5 **Fire Control (FIRE CTL).** Provide one Fire Control Room for each company on the second and third floor.

2-2.3.5.1 Function: Storage

2-2.3.5.2 Furnishings/Fixtures/Equipment: None.

##### 2-2.3.5.3 Finishes:

Floor: sealed concrete

Base: resilient base.

Walls: painted gypsum wallboard

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.5.4 Other requirements: Provide 914 mm [3'-0"] wide entry door. The walls, doors, floors and ceiling must be constructed to meet Risk Level II requirements as specified in AR 190-51, Appendix B.

2-2.4 **BUILDING 355 SUPPORT AREAS.** Only able-bodied personnel will occupy Building 355 support areas; handicapped accessibility is not required, except that stairs and corridors shall comply with handicapped accessibility requirements of applicable codes.

2-2.4.1 **Mechanical Room(s) (MECH).** Provide dedicated areas for mechanical equipment located on all floors of Building 355. Each company shall have independent operation and control of HVAC system for its own spaces, but mechanical equipment may serve more than one company, and mechanical rooms may be combined. Mechanical rooms shall not be used for storage or other purposes. Access will be limited to

authorized personnel. Provide floor openings and vertical shaft spaces as necessary.

2-2.4.1.1 Function: Spaces for HVAC, water heating, and other plumbing and mechanical equipment.

2-2.4.1.2 Furnishings/Fixtures/Equipment: None.

2-2.4.1.3 Finishes: Floor: sealed concrete

Base: resilient cove base

Walls: painted impact resistant gypsum board.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.4.1.4 Other requirements: Doors shall have storeroom function lockset master-keyed to existing system.

2-2.4.2 **Electrical Room(s) (ELE).** Provide dedicated areas for electrical equipment located on all floors of Building 355. Each company shall have independent metering and control of the electrical system for its own spaces, but electrical equipment may serve more than one company, and electrical rooms may be combined. Electrical rooms shall not be used for storage or other purposes. Access will be limited to authorized personnel. Provide floor openings and vertical shaft spaces as necessary.

2-2.4.2.1 Function: Spaces for electrical equipment.

2-2.4.2.2 Furnishings/Fixtures/Equipment: None.

2-2.4.2.3 Finishes: Floor: sealed concrete

Base: resilient cove base

Walls: painted gypsum wallboard or painted concrete masonry units

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.4.2.4 Other requirements: Electrical service to buildings shall be underground. Doors shall have storeroom function lockset master-keyed to existing system..

2-2.4.3 **Telecommunication Room (TELE).** Provide dedicated interior room(s) for communication distribution equipment located on all floors of Building 355. Room(s) shall be dedicated to one company, and shall not be combined with mechanical or electrical rooms. Room(s) may be accessed from Administrative Area Corridor, public unsecure corridor (if provided), or Equipment Maintenance Area. Access will be limited to authorized personnel. Provide each company with one main communication room; minimum size 3048 mm [10'-0"] x 3353 mm [11'-0"]. Provide additional communication rooms as needed; all spaces having telephone or computer data outlets shall be located to allow a maximum cable length of 90 m [295 feet] between outlet and communication room. Minimum dimensions of secondary communication rooms shall be 2134 mm [7'-0"] x 3048 mm [10'-0"]. Provide floor openings and vertical shaft spaces as necessary.

2-2.4.3.1 Function: Telephone and data network support spaces for the COF.

2-2.4.3.2 Furnishings/Fixtures/Equipment: None.

2-2.4.3.3 Finishes: Floor: vinyl composition tile

Base: resilient cove base

Walls: painted gypsum wallboard.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.4.3.4 Other requirements: Door shall have minimum 914 mm [3'-0"] wide door with storeroom function lockset **master-keyed to existing system..**

2-2.4.4     **Existing Sprint Switch Room (EXIST SPRINT SW RM).** Located on the first floor. Existing dedicated interior room for communication distribution equipment.

2-2.4.4.1    Function: Telephone and data network support spaces for the COF.

2-2.4.4.2    Furnishings/Fixtures/Equipment: None.

2-2.4.4.3    Finishes: Floor: vinyl composition tile

Base: resilient cove base

Walls: .painted concrete masonry units.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.4.4.4    Other requirements: Door shall have minimum 914 mm [3'-0"] wide door with storeroom function I master-keyed to existing system.

2-2.4.5     **Exterior Stairs.** Provide as required to allow circulation to upper floor of the building. Comply with applicable code egress requirements. This description covers all Exterior Stairs at for Building 355.

2-2.4.5.1    Function: Circulation and means of egress.

2-2.4.5.2    Furnishings/Fixtures/Equipment (FFE): None.

2-2.4.5.3    Finishes: Landing floor: sealed concrete with slip-resistant finish texture.

Base: exterior wall material

Treads: Sealed concrete with slip-resistant nosing

Risers: sealed concrete

Walls: exterior wall materials

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.4.5.4    Other requirements: Stairs shall comply with handicap accessibility requirements of applicable codes. Railing shall be designed in accordance with applicable codes. Refer to Chapter 5 for hardware and security requirements for exterior doors.

2-2.4.6     **Breezeway (BREEZEWAY).** Occurs on the first floor of Building 355. Refers to an unconditioned, covered corridor space that is enclosed on the long sides, but open to the exterior on the ends. Provide as required to allow circulation to building spaces and comply with applicable code egress requirements.

2-2.4.6.1    Function: Circulation and means of egress.

2-2.4.6.2    Furnishings/Fixtures/Equipment (FFE): Provide mechanical and electrical systems to comply with applicable codes. All fixtures and equipment shall be suitable for exterior locations. The following item shall be Contractor furnished and installed: provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-2.4.6.3    Finishes:

Floor: sealed concrete

Base: Exterior wall material

Walls: Exterior wall material

Ceiling: painted exterior gypsum soffit board.

2-2.4.6.4    Other requirements: With the exception of fire sprinkler systems, no piping, conduit or ductwork shall be exposed in breezeway. Provide slip resistant finish texture on concrete floor.

**2-2.4.7 Exterior Corridor (LANAI).** Refers to an unconditioned, covered circulation space that is enclosed on one long side (adjacent to the building), and has a guardrail on the other side. Allow circulation to building spaces. Exterior corridor shall comply with applicable code egress requirements. Exterior corridors provide link with stairs and other circulation components. Exterior corridors shall not be used to provide access to living units

**2-2.4.7.1** Function: Circulation and means of egress.

**2-2.4.7.2** Furnishings/Fixtures/Equipment (FFE): Provide mechanical and electrical systems to comply with applicable codes. The following items will be Contractor furnished and installed: fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes. All fixtures and equipment shall be suitable for exterior locations.

**2-2.4.7.3** Finishes:

Floor: sealed concrete

Base: Exterior wall material

Walls: Exterior wall material

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

**2-2.4.7.4** Other requirements: Handicap accessible. With the exception of fire sprinkler systems, no piping, conduit or ductwork shall be exposed in exterior corridor. Provide slip resistant finish texture on concrete floor. Guardrails shall be designed in accordance with applicable codes.

**2-2.5 Common Locker/Shower Facilities (COF TOILET/SHOWER).** Provide one group of men's and one group of women's common locker/shower facilities for each company. Three (3) COF Toilet/Shower shall be provided, one on each floor, in Building 355. Two (2) COF Toilet/Shower shall be provided on the second floor in Building 357. The COF Toilet/Shower for the Large COF shall be located on the third floor of Building 355. Quantities of lockers and plumbing fixtures for men and women vary by company size. Provide the quantity of lockers and fixtures for Medium Company Operations Facility on the first and second floor and as indicated in the table below. Provide the quantity of lockers and fixtures for Large Company Operations Facility on the third floor and as indicated in the table below. Soldiers will use locker rooms before and after physical training. Handicapped accessibility is not required. Additional entrances may be provided from a common public corridor in the COF. Entrances shall be separate and distinct from the entrances to company supply and administrative areas. Exterior entrance vestibules shall be provided. Entrances shall provide visual privacy into the spaces.

**Table 2-2.5 Locker Room Plumbing Fixture and Locker Quantities**

	LARGE COMPANY		MEDIUM COMPANY	
	MEN	WOMEN	MEN	WOMEN
<b>Lockers</b>	150	14	82	8
<b>Toilets</b>	2	2	2	1
<b>Urinals</b>	2	-	1	-
<b>Lavatories</b>	4	1	2	1
<b>Showers *</b>	8	2	5	1

**2-2.5.1 Women's Locker Room.** Provide one or more rooms, sized to accommodate the number of lockers and plumbing fixtures required for each company served. Provide exterior entrance(s) with vestibule. For egress purposes, the occupant load shall be equal to the higher of the following numbers: a) the number of lockers in the room, or b) the code determined number of occupants calculated by multiplying room area x the occupant load factor.

**2-2.5.1.1** Function: Toilets, showers and lockers for female soldiers.

**2-2.5.1.2** Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and

installed: floor mounted toilets, wall-hung lavatories, and ceramic tile shower enclosures in the quantities indicated in the table above. Provide toilet partitions at each toilet. Provide the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one sanitary napkin disposal per toilet; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet; one soap holder per shower; one shower curtain and rod at each shower; two double pin robe hooks at each dressing compartment; one robe hook on each toilet partition door; one sanitary napkin and tampon vending machine. Provide 305 mm [1'-0"] of locker room bench per 5 lockers provided. Provide two wall mounted GFCI electric outlets per two lavatories (or fraction thereof); mount adjacent to mirrors. Provide electric water cooler (EWC) at entrance vestibule from exterior. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

#### 2-2.5.1.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile.

Ceiling: painted water resistant gypsum board.

2-2.5.1.4 Other requirements: Provide 914 mm [3'-0"] wide entry door. Locks shall be as specified in paragraph 5-4.9.5.3.

2-2.5.2 **Men's Locker Room.** Provide one or more rooms, sized to accommodate the number of lockers and plumbing fixtures required for each company served. Provide exterior entrance(s) with vestibule.

For egress purposes, the occupant load shall be equal to the higher of the following numbers: a) the number of lockers in the room, or b) the code determined number of occupants calculated by multiplying room area x the occupant load factor.

2-2.5.2.1 Function: Toilets, showers and lockers for male soldiers.

2-2.5.2.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets, wall-hung lavatories, and ceramic tile shower enclosures in the quantities indicated in the table above. Provide toilet partitions at each toilet. Provide the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet; one soap holder per shower; one shower curtain and rod at each shower; one double pin robe hook outside each shower; one robe hook on each toilet partition door. Provide 305 mm [1'-0"] of locker room bench per 5 lockers provided. Provide two wall mounted GFCI electric outlets per two lavatories (or fraction thereof); mount adjacent to mirrors. Provide electric water cooler (EWC) at entrance vestibule from exterior. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

#### 2-2.5.2.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile.

Ceiling: painted water resistant gypsum board.

2-2.5.2.4 Other requirements: Provide 914 mm [3'-0"] wide entry door. Locks shall be as specified in paragraph 5-4.9.5.3.

## 2-3 BUILDING 355 - GYMNASIUM FUNCTIONAL AND AREA REQUIREMENTS.

2-3.1 Function: Multi-function space.

2-3.2       Furnishings/Fixtures/Equipment: reuse existing basketball backboards

2-3.3       Minimum Finishes:

Floor: Refinish existing floors and stripe as directed and seal.

Base: none

Walls: paint existing walls-and decorative wall elements; new seismic work cannot cover existing decorative wall elements. Offeror must incorporate eclectic wall features into the seismic wall design and cannot conceal existing Historic features.

Ceiling: apply one-hour fire resistive material to existing metal deck and truss roof structure.

**2-4       BUILDING 356 and 358 - UNACCOMPANIED ENLISTED PERSONNEL HOUSING (UEPH) FACILITIES FUNCTIONAL AND AREA REQUIREMENTS.** The UEPH building(s) shall consist of living units, common areas, and support spaces that will occupy all three floors of Building 356 and 358. Each living unit shall be designed to be occupied by one or two soldiers. Provide 66 Two-person living units and 18 One-person living units to house a total of 150 enlisted personnel. Living units and common areas are equally distributed among three floors in Buildings 356 and 358. Only able-bodied military personnel will occupy UEPH Buildings; handicapped accessibility is not required. Building spaces and areas shall be as follows:

2-4.1       **Areas Comprising the Two-Person Living Unit (1+1 Module).** Each Two-Person living unit, or module, will contain two individual living/sleeping rooms with closets, and a shared service area with Kitchen, and a shared bathroom. Spaces are as follows.

2-4.1.1     **Individual Living/Sleeping Room (BEDROOM 1/BEDROOM 2).** Provide two per module.

2-4.1.1.1   Function: Private bedroom and living space for one enlisted person.

2-4.1.1.2   Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: One twin bed with headboard and footboard 102mm x 2083mm [40" x 85"]; one entertainment center for occupant's television and sound system 864mm wide x 635mm deep x 1930mm high [34" x 25" x 76"]; one chest of drawers 712mm wide x 458mm deep x 661mm high [28" x 18" x 26" high]; one nightstand 485mm wide x 435mm deep x 535mm high [19" x 17" x 21" high]; one desk 1524mm wide x 762mm deep (with keyboard tray retracted) x 762mm high [60" wide x 30" deep x 30" high]; and one desk chair 500mm wide x 535mm deep x 851mm high [19-1/2" x 21" x 33-1/2" high].

2-4.1.1.3   Minimum Finishes:

Floor: carpet

Base: resilient cove base.

Walls: gypsum wallboard with full-height Sisal Fabric wallcovering.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.1.1.4   Other requirements: Living/sleeping room shall have at least one exterior operable window with insect screen. Window shall meet egress requirements of NFPA 101 and Unified Facilities Criteria (UFC) 1-200-01 and International Building Code (IBC) 2000. Window shall not be located adjacent to an exterior corridor or breezeway. Door between service area and living/sleeping room shall have electronic lockset. Door between public corridor and service area shall have electronic lockset. Provide minimum of one combination telephone/data outlet in each Living /Sleeping room. Provide minimum of one cable television outlet in each Living/Sleeping room. Coordinate outlet locations with furniture arrangement. Refer to Chapter 9 Electrical Systems.

2-4.1.2     **Closet (CLOSET).** Provide one per living/sleeping room.



2-4.1.2.1 Function: Private walk-in closet for clothing and storage of boxes and field gear.

2-4.1.2.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: rod and shelf, as indicated on the RFP Concept Drawings.

2-4.1.2.3 Minimum Finishes:

Floor: vinyl composition tile

Base: resilient cove base

Walls: painted gypsum wallboard

Ceiling: painted gypsum wallboard.

2-4.1.2.4 Other requirements: Door shall have passage function latchset and be equipped with a hasp so the occupant can provide his/her own padlock.

2-4.1.3 **Kitchen (KITCHEN).** Provide one per module.

2-4.1.3.1 Function: Circulation space, food preparation area, and eating area for occupants.

2-4.1.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one refrigerator-freezer (minimum 9 total cubic feet); one microwave oven (min .9 cubic feet, 800 watts) mounted under wall cabinets.

The following item will be Contractor furnished and installed: minimum 1500 linear mm [5'-0"] of 600mm [2'-0"] deep kitchen base cabinets and countertop (including cooktop/range width), and 2100 linear mm [7'-0"] of 300mm [12"] deep wall cabinets. Wall cabinets shall be minimum 600mm [2'-0"] high; provide 600 mm [2'-0"] clear between countertop and bottom of wall cabinets at sink. Base cabinets shall have minimum of two 300 mm [12"] wide drawers; provide plastic laminate countertop with integral side and backsplashes at walls. Provide single compartment, stainless steel kitchen sink with food strainer/stopper, minimum inside dimensions 400mm x 400mm x 175mm deep [1'-4" x 1'-4" x 7" deep], with chrome-plated, single handle, washerless mixing faucet (refer to Chapter 8); provide fire extinguisher mounted inside base cabinet. One 4-burner electric cooktop, rangehood with exterior exhaust and garbage disposal shall be priced separately as Option No. 2, see proposal Schedule, Section 00010.

2-4.1.3.3 Minimum Finishes:

Floor: vinyl composition tile

Base: resilient cove base

Walls: painted gypsum wallboard; Wall area between countertop and wall cabinets: plastic laminate.

Ceiling: painted gypsum wallboard.

2-4.1.3.4 Other requirements: Door between public corridor and service area (entry door into module) shall have interlocking threshold.

2-4.1.4 **Bathroom (BATHROOM).** Provide one per module.

2-4.1.4.1 Function: Bathing and toilet facilities for either occupant; storage for both occupants' bath articles.

2-4.1.4.2 Furnishings/Fixtures/Equipment (FFE): All the following items listed will be Contractor furnished and installed: Lavatory that shall be minimum 475mm x 475mm [19" x 19"] self-rimming vitreous china, or cast-filled acrylic or solid surfacing material integrally molded to countertop; provide chrome-plated washerless faucet with pop-up drain (refer to Chapter 8); Countertop shall be minimum 900mm [3'-0"] wide cast-filled acrylic, acrylic solid surfacing material, or plastic laminate with integrally molded, 100mm high coved backsplash. Provide 102mm high side splash at side walls. Provide plastic laminate surfaced vanity base cabinet with hinged door(s) and minimum two 225mm [9"] wide drawers. Provide 6mm [1/4"] thick x minimum 1050mm [3'-6"] high mirror glass, full width of vanity countertop, with wall mounted vanity light

fixture above mirror (refer to Chapter 9). Provide one recessed medicine cabinet, two soap holders, two toothbrush/tumbler holders. Provide floor mounted toilet with full seat and seat cover (lid). Provide bathtub, chrome-plated brass showerhead, and anti-scald single-handle mixing valve (refer to Chapter 8). Provide two minimum 600mm [2'-0"] long towel bars mounted on walls outside tub/shower enclosure, two wall mounted soap holders in the tub/shower, and one door mounted robe hook with two hooks. Provide wall mounted retractable clothesline across tub/shower. Provide mildew-resistant vinyl shower curtain with stainless steel curtain hooks and chrome-plated brass shower curtain rod. Provide single roll toilet tissue dispenser.

2-4.1.4.3 Minimum Finishes:

Floor: ceramic tile

Base: ceramic tile sanitary cove base

Walls: full height ceramic tile. Walls around shower/tub enclosure shall be full height ceramic tile.

Ceiling: painted water resistant gypsum board.

2-4.1.4.4 Other requirements: HVAC system shall exhaust bathroom air; refer to Chapter 10. Door shall have privacy function lockset.

2-4.2 **Areas Comprising the One-Person Living Unit (Single Unit Module).** Each One-Person living unit, or module, will contain a living/sleeping room with closet, a service area with Kitchen, and a bathroom. Spaces are as follows.

2-4.2.1 **Living/Sleeping Room (BEDROOM).** Provide one per module.

2-4.2.1.1 Function: Private bedroom and living space for one senior enlisted person.

2-4.2.1.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: One twin bed with headboard and footboard 102mm x 2083mm [40" x 85"]; one entertainment center for occupant's television and sound system 864mm wide x 635mm deep x 1930mm high [34" x 25" x 76"]; one chest of drawers 712mm wide x 458mm deep x 661mm high [28" x 18" x 26" high]; one nightstand 485mm wide x 435mm deep x 535mm high [19" x 17" x 21" high]; one desk 1524mm wide x 762mm deep (with keyboard tray retracted) x 762mm high [60" wide x 30" deep x 30" high]; and one desk chair 500mm wide x 535mm deep x 851mm high [19-1/2" x 21" x 33-1/2" high].

2-4.2.1.3 Minimum Finishes:

Floor: carpet

Base: resilient cove base

Walls: gypsum wallboard with full-height Sisal Fabric wallcovering

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.2.1.4 Other requirements: Living/sleeping room shall have at least one exterior operable window with insect screen. Window shall meet egress requirements of NFPA 101 and Unified Facilities Criteria (UFC) 1-200-01 and International Building Code (IBC) 2000. Window shall not be located adjacent to an exterior corridor or breezeway. Provide minimum of one combination telephone/data outlet on in each Living /Sleeping room. Provide minimum of one cable television outlet in each Living/Sleeping room. Coordinate outlet locations with furniture arrangement. Refer to Chapter 9 Electrical Systems.

2-4.2.2 **Closet (CLOSET).** Provide one per living/sleeping room.

2-4.2.2.1 Function: Private walk-in closet for clothing and storage of boxes and field gear.

2-4.2.2.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: rod and shelf, as indicated on RFP Contract Drawings.

2-4.2.2.3 Minimum Finishes:

Floor: vinyl composition tile  
 Base: resilient cove base  
 Walls: painted gypsum wallboard or painted veneer plaster  
 Ceiling: painted gypsum wallboard.

2-4.2.2.4 Other requirements: Door shall have passage function latchset and be equipped with a hasp so the occupant can provide his/her own padlock.

2-4.2.3 **Kitchen (KITCHEN).** Provide one per module.

2-4.2.3.1 Function: Circulation space, food preparation area, and eating area for occupant and visitors.

2-4.2.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one refrigerator-freezer (minimum 9 total cubic feet); one microwave oven (min .9 cubic feet, 800 watts) mounted under wall cabinets.

The following item will be Contractor furnished and installed: minimum 1500 linear mm [5'-0"] of 600mm [2'-0"] deep kitchen base cabinets and countertop (including cooktop/range width), and 2100 linear mm [7'-0"] of 300mm [12"] deep wall cabinets. Wall cabinets shall be minimum 600mm [2'-0"] high; provide 600 mm [2'-0"] clear between countertop and bottom of wall cabinets at sink. Base cabinets shall have minimum of two 300 mm [12"] wide drawers; provide plastic laminate countertop with integral side and backsplashes at walls. Provide single compartment, stainless steel kitchen sink with food strainer/stopper, minimum inside dimensions 400mm x 400mm x 175mm deep [1'-4" x 1'-4" x 7" deep], with chrome-plated, single handle, washerless mixing faucet (refer to Chapter 8); provide fire extinguisher mounted inside base cabinet. One 4-burner electric cooktop, rangehood with exterior exhaust and garbage disposal shall be priced separately as Option No. 2, see proposal Schedule, Section 00010.

2-4.2.3.3 Minimum Finishes:

Floor: vinyl composition tile  
 Base: resilient cove base  
 Walls: painted gypsum wallboard; Wall area between countertop and wall cabinets: plastic laminate.  
 Ceiling: painted gypsum wallboard.

2-4.2.3.4 Other requirements: Door between public corridor and service area (entry door into module) shall have interlocking threshold.

2-4.2.4 **Bathroom (BATHROOM)** . Provide one per module.

2-4.2.4.1 Function: Bathing and toilet facilities for occupant; storage for occupants' bath articles.

2-4.2.4.2 Furnishings/Fixtures/Equipment (FFE): All the following items listed will be Contractor furnished and installed: Lavatory that shall be minimum 475mm x 475mm [19" x 19"] self-rimming vitreous china, or cast-filled acrylic or solid surfacing material integrally molded to countertop; provide chrome-plated washerless faucet with pop-up drain (refer to Chapter 8); Countertop shall be minimum 900mm [3'-0"] wide cast-filled acrylic, acrylic solid surfacing material, or plastic laminate with integrally molded, 100mm high coved backsplash. Provide 102mm high side splash at side walls. Provide plastic laminate surfaced vanity base cabinet with hinged door(s) and minimum two 225mm [9"] wide drawers. Provide 6mm [1/4"] thick x minimum 1050mm [3'-6"] high mirror glass, full width of vanity countertop, with wall mounted vanity light fixture above mirror (refer to Chapter 9). Provide one recessed medicine cabinet, two soap holders, two toothbrush/tumbler holders. Provide floor mounted toilet with full seat and seat cover (lid). Provide bathtub, chrome-plated brass showerhead, and anti-scald single-handle mixing valve (refer to Chapter 8). Provide two minimum 600mm [2'-0"] long towel bars mounted on walls outside tub/shower enclosure, two wall mounted soap holders in the tub/shower, and one door mounted robe hook with two hooks. Provide wall mounted retractable clothesline across tub/shower. Provide mildew-resistant vinyl shower curtain with stainless steel curtain hooks and chrome-plated brass shower curtain rod. Provide single roll toilet tissue dispenser.

**2-4.2.4.3 Finishes:**

Floor: ceramic tile

Base: ceramic tile sanitary cove base

Walls: full height ceramic tile. Walls around shower/tub enclosure shall be full height ceramic tile.

Ceiling: painted water resistant gypsum board.

**2-4.2.4.3 Other requirements:** HVAC system shall exhaust bathroom air; refer to Chapter 10. Door shall have privacy function lockset.

**2-4.3 BUILDING 356 and 358 UEPH COMMON AREAS.** Common areas will be shared by soldiers. Spaces are as follows:

**2-4.3.1 Entry Lobby.** Provide two per floor. Located across the Lanai from the Game Room.

**2-4.3.1.1 Function:** Primary entry point into the UEPH facility; waiting area for visitors.

**2-4.3.1.2 Furnishings/Fixtures/Equipment:** the following items will be Government furnished and installed: four upholstered modular waiting-area seating units with two modular end table units. Seating shall accommodate 6 people.

**2-4.3.1.3 Finishes:**

Floor: vinyl composition tile.

Base: resilient cove base.

Walls: painted gypsum wallboard.

Ceiling: First and Second Floor ceiling: patch existing exposed ceiling to match existing adjacent and paint.

Third Floor ceiling: Suspended acoustic tile ceiling grid system.

**2-4.3.1.4 Other requirements:** Provide conduit and junction box for cable television service to wall or ceiling mounted television. Provide telephone outlet for public payphone.

**2-4.3.2 Lounge Area (LOUNGE).** Provide one area per floor. The Lounge alcove space is open to interior corridor.

**2-4.3.2.1 Function:** Space for building occupants to relax.

**2-4.3.2.2 Furnishings/Fixtures/Equipment:** the following items will be Government furnished and installed: minimum of six upholstered modular waiting-area seating units with two modular end table units. Seating shall accommodate 8 people. Provide ceiling or wall mounted television bracket with locking tray. Arrange seating to allow viewing of television (TV is government furnished, government installed). The following item will be Contractor furnished and installed: fire extinguisher in semi-recessed fire extinguisher cabinets to comply with applicable codes.

**2-4.3.2.3 Finishes:** Match adjacent Interior Corridor.

**2-4.3.2.4 Other requirements:** Provide conduit and junction box for cable television service to wall or ceiling mounted television. Provide telephone outlet for public payphone.

**2-4.3.3 Game Room (GAME ROOM).** Provide two per floor. Provide area for vending machines and ice machine-dispensers.

**2-4.3.3.1 Function:** additional space for building occupants to entertain.

2-4.3.3.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: one ice cube machine-dispenser designed for hotel ice bucket filling, capable of producing minimum 250 lbs. of regular ice cubes in 24 hours, with 180 lb. storage; one ice machine manufacturer's automatic cleaning system to clean and sanitize the water distribution system of the machine at scheduled intervals; Ice machine shall be Energy Star compliant; four full-size soft drink and snack vending machines. Vending machines will not require plumbing connections. Game machines The following item will be Contractor furnished and installed: fire extinguisher in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-4.3.3.3 Finishes:

Floor: vinyl composition tile.

Base: resilient cove base.

Walls: painted gypsum wallboard,

Ceiling: patch existing exposed ceiling to match existing adjacent and paint..

2-4.3.3.4 Other requirements: Provide a pair of 914 mm [3'-0"] wide entry doors. Provide electrical power to accommodate vending machines, game machines, and to comply with applicable codes.

2-4.3.4 **Men's Toilet (MEN).** Provide two private toilet rooms per floor. Room shall be accessed from Game Room.

2-4.3.4.1 Function: Men's single-occupant toilet and lavatory.

2-4.3.4.2 Furnishings/Fixtures/Equipment (FFE): the following items will be Contractor furnished and installed: one floor mounted toilet, one wall-hung lavatory, mirror with shelf above lavatory, paper towel dispenser/waste receptacle, soap dispenser, one toilet seat cover dispenser; and toilet tissue dispenser.

2-4.3.4.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile wainscot 1219 mm high with painted water-resistant gypsum board above.

Ceiling: painted gypsum wallboard.

2-4.3.4.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-4.3.5 **Women's Toilet (WOMEN).** Provide two private toilet rooms per floor. Room shall be accessed from Game Room.

2-4.3.5.1 Function: Women's single-occupant toilet and lavatory.

2-4.3.5.2 Furnishings/Fixtures/Equipment (FFE): the following items will be Contractor furnished and installed: one floor mounted toilet, one wall-hung lavatory, mirror with shelf above lavatory, paper towel dispenser/waste receptacle, soap dispenser, one toilet seat cover dispenser; and toilet tissue dispenser.

2-4.3.5.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile wainscot 1219 mm high with painted water-resistant gypsum board above.

Ceiling: painted gypsum wallboard.

2-4.3.5.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-4.3.6 **Janitor Closet (JAN).** Provide three per floor.

2-4.3.6.1 Function: Service Sink, and storage of cleaning supplies.

2-4.3.6.2 Furnishings/Fixtures/Equipment: the following items will be Contractor furnished and installed: floor mop sink, mop rack for three mops, and minimum 1829 linear mm of wall mounted stainless steel shelving.

2-4.3.6.3 Finishes:

Floor: vinyl composition tile

Base: resilient cove base.

Walls: painted water-resistant gypsum wallboard, or painted concrete masonry units

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.3.6.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-4.3.7 **Laundry Area(s) (LAU).** Provide one per floor. Provide one clothes washer per 12 soldiers, and one clothes dryers per 8 soldiers (round fractional numbers to the next highest whole number). Provide minimum of one laundry room on each floor of the UEPH facility. Provide minimum five washers and seven dryers in each room.

2-4.3.7.1 Function: Self-service washers and dryers and clothes folding areas for residents.

2-4.3.7.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: commercial quality clothes washers and dryers (each minimum 2.5 cubic feet capacity), non-coin operation; Stacked dryers are preferred; Appliances shall be Energy Star compliant; two vandal-resistant waiting chairs per each four washers. The room shall accommodate one wall mounted laundry product vending machine in each laundry room.

The following item will be Contractor furnished and installed: minimum 1800 linear mm [6'-0"] of 600 mm [2'-0"] deep base cabinets and countertops for folding clothes; provide one each service sink.

2-4.3.7.3 Finishes:

Floor: quarry tile

Base: quarry tile

Walls: painted water resistant gypsum wallboard, or painted concrete masonry units

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.3.7.4 Other requirements: Conceal utilities from view, but provide easy maintenance access; locate utility connections 914 mm [36"] above finish floor, unless otherwise recommended by manufacturer.

Provide one floor drain for every four washers; locate outside of traffic area. Provide venting of dryer exhaust as on RFP Concept Drawings with lint catchment system. Lint catchment system shall be designed to be maintained within the Laundry Room. Partitions around laundry rooms shall extend to underside of floor above. Provide 914 mm [3'-0"] wide door(s) into room.

2-4.4 **BUILDING 356 and 358 UEPH SUPPORT AREAS.** Support areas include circulation spaces such as stairs and corridors, mechanical, electrical, and communications spaces. Spaces are as follows:

2-4.4.1 **Interior Corridor.** Provide as required to allow circulation to building spaces, and comply with applicable code egress requirements. Due to security, climate, and force protection concerns, interior corridors are the preferred means of circulation between living units and other building spaces.

2-4.4.1.1 Function: Circulation and means of egress.

2-5.4.1.2 Furnishings/Fixtures/Equipment (FFE): Provide mechanical and electrical systems to comply with applicable codes. The following items will be Contractor furnished and installed: fire extinguishers in

semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-4.4.1.3 Finishes:

Floor: vinyl composition tile

Base: resilient cove base.

Walls: painted finish.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint. Suspended acoustic tile ceiling grid system at Third Floor.

2-5.4.1.4 Other requirements: Handicap accessible.

2-4.4.2 **Exterior Corridor (LANAI).** Refers to an unconditioned, covered circulation space that is enclosed on one long side (adjacent to the building), and has a guardrail on the other side. Allow circulation to building spaces. Exterior corridor shall comply with applicable code egress requirements. Exterior corridors provide link with stairs and other circulation components. Exterior corridors shall not be used to provide access to living units

2-4.4.2.1 Function: Circulation and means of egress.

2-5.4.2.2 Furnishings/Fixtures/Equipment (FFE): Provide mechanical and electrical systems to comply with applicable codes. The following items will be Contractor furnished and installed: fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes. All fixtures and equipment shall be suitable for exterior locations.

2-4.4.2.3 Finishes:

Floor: sealed concrete

Base: Exterior wall material

Walls: Exterior wall material

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.4.2.4 Other requirements: Handicap accessible. With the exception of fire sprinkler systems, no piping, conduit or ductwork shall be exposed in exterior corridor. Provide slip resistant finish texture on concrete floor. Guardrails shall be designed in accordance with applicable codes.

2-4.4.3 **Exterior Stairs.** required to allow circulation to upper floors of the building, and to comply with applicable code egress requirements. This description covers all Exterior Stairs for Building 356 and 358.

2-4.4.3.1 Function: Circulation and means of egress.

2-4.4.3.2 Furnishings/Fixtures/Equipment (FFE):

2-4.4.3.3 Finishes: Landing floor: sealed concrete with slip-resistant finish texture.

Base: Exterior wall material

Treads: Sealed concrete with slip-resistant finish texture. Provide slip-resistant nosing.

Risers: sealed concrete.

Walls: exterior wall materials

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.4.3.4 Other requirements: Stairs shall comply with handicap accessibility requirements of applicable codes. Railings shall be designed in accordance with applicable codes. Refer to Chapter 5 for hardware and security requirements for exterior doors.

2-4.4.4 **Mechanical Areas (MECH).** Provide dedicated interior spaces and exterior areas for plumbing, fire protection, and HVAC equipment. Size and locate rooms to allow equipment removal and maintenance Provide

floor openings and vertical shaft spaces as necessary.

2-4.4.4.1 Function: Mechanical support spaces for the UEPH building.

2-4.4.4.2 Furnishings/Fixtures/Equipment: None.

2-4.4.4.3 Finishes:

Floor: sealed concrete

Base: resilient cove base

Walls: painted gypsum wallboard, or painted concrete masonry units

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.4.4.4 Other requirements: Locate air intake and exhaust openings to provide optimum indoor air quality. Roof mounted equipment shall not be used. Provide masonry screen walls with lockable metal access gates around outdoor equipment areas (refer to Chapter 3); comply with force protection standards. Doors shall have storeroom function lockset master-keyed to existing system.

2-4.4.5 **Electrical Rooms (ELEC).** Provide dedicated interior spaces and exterior areas for electrical equipment. Rooms shall allow easy equipment removal and maintenance. Provide floor openings and vertical shaft spaces as necessary.

2-4.4.5.1 Function: Electrical support spaces for the UEPH building.

2-4.4.5.2 Furnishings/Fixtures/Equipment: None.

2-4.4.5.3 Finishes:

Floor: sealed concrete

Base: resilient cove base

Walls: painted gypsum wallboard.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.4.5.4 Other requirements: Electrical service to the building shall be underground. Door shall have storeroom function lockset master-keyed to existing system. .

2-4.4.6 **Telecommunication Room (TELE).** Provide dedicated interior rooms for communication equipment. Rooms shall allow easy equipment removal and maintenance.

2-4.4.6.1 Function: Telephone and data network support spaces for the UEPH building.

2-4.4.6.2 Furnishings/Fixtures/Equipment: As required by Statement of Work.

2-4.4.6.3 Finishes:

Floor: vinyl composition tile

Base: resilient cove base

Walls: painted gypsum wallboard.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.4.6.4 Other requirements: Communication service to the building shall be underground. Provide minimum 914 mm [3'-0"] wide door with storeroom function lockset master-keyed to existing system. . Provide floor openings and vertical shaft spaces as necessary. Provide a minimum of three 102 mm [4"] diameter empty conduits between vertically stacked communication rooms.

2-4.4.7 **Utility/Cor (UTIL/COR).** Provide two areas per floor.



2-4.4.7.1 Function: Space for building utilities

2-4.4.7.2 Furnishings/Fixtures/Equipment: None.

2-4.4.7.3 Finishes:

Floor: vinyl composition tile

Base: resilient cove base

Walls: painted gypsum wallboard.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.4.7.4 Other requirements: Provide 914 mm [3'-0"] wide door with storeroom function lockset.

## **2-5 BUILDING 357 - DINING FACILITY FUNCTIONAL AND AREA REQUIREMENTS.**

The dining facility for enlisted personnel will employ cafeteria-style service and will be equipped to allow for service of both full menu and short order, fast food types of meals, carry-out and ala carte.

The Dining Facility will be constructed on the ground floor of Building 357. The minimum seat count for the facility is 374 people per seating. The Design-Build Offeror shall verify and adjust room layout to ensure that the minimum number of tables/seats is accounted for. Major functional areas include Dining, Kitchens, serving and sit down dining, dish washing, employee lockers and toilets, food preparation and cooking, garbage and trash disposal, non-provisional storage, patron toilets, office(s), pot and pan washing, receiving platform, refrigerated and dry storage, serving, and signature-head count, cashier station(s), and staging area. Space for entry canopies for climate control and receiving platforms are included in this project.

Final Dining Facility Design shall be coordinated and approved by The Army Community of Excellence, Subsistence (ACES); The Design-Build offeror should contact Goldie Bailey (tel. 804-734-3354).

**2-5.1 Dining Facility Food Service Areas.** Public areas where food is displayed, purchased, and consumed.

**2-5.1.1 Dining Area (DINING AREA#1, #2,#3, #4, AND #5).** Provide four separate areas as indicated on the first floor. Provide one additional dining area on the second floor.

2-5.1.1.1 Function: Dining area for soldiers.

2-5.1.1.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: tables and seating for a minimum of 300 people. Also, see RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items will be Government or Contractor furnished and installed.

2-5.1.1.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard and painted concrete wall.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.1.1.4 Other requirements: Room shall have exterior window. Provide a pair of historic doors as required. Provide exit devices as required by code.

**2-5.1.2 Beverage/Condiment Area & Salad/Hot Bar(BEVERAGES/CONDIMENTS and Salad/Hot**

**Bar).** Provide one as indicated.

2-5.1.2.1 Function: Food service area for soldiers.

2-5.1.2.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.1.2.3 Finishes:

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: ceramic tile

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.1.3 **Short Order Area, Specialty Cooking, and Service Line (SHORT ORDER, SPECIALTY COOKING, AND SERVICE LINE).** Provide one area per function as indicated.

2-5.1.3.1 Function: Food service area for soldiers.

2-5.1.3.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.1.3.3 Finishes:

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: ceramic tile

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.1.3.4 Other requirements: Room shall have exterior window.

2-5.1.4 **Snack Bar (SNACK BAR).** Provide one as indicated.

2-5.1.4.1 Function: Food service area for soldiers.

2-5.1.4.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.1.4.3 Finishes:

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: ceramic tile

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.1.4.4 Other requirements: Room shall have exterior window. Provide a pair of historic doors as required; door shall have hold open device and entry function lockset.

2-5.1.5 **Snack Storage (SNACK STORAGE).** Provide one as indicated.

2-5.1.5.1 Function: Snack Bar storage.

2-5.1.5.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts

referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.1.5.3 Finishes:

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: painted gypsum wallboard

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.1.6 **Check-In (CHECK-IN).** Provide one as indicated.

2-5.1.6.1 Function: Main entry point into the Dining Facility for soldiers and guests. Location of cashier, tray dispenser, and electronic menu board.

2-5.1.6.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.1.6.3 Finishes:

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: painted gypsum wallboard

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.1.6.4 Other requirements: Provide a pair of historic doors as required.

2-5.2 **DINING FACILITY WORK AREAS** Non-Public areas where food preparation, storage, cleaning, and receiving occur.

2-5.2.1 **Dishwash Room (DISHWASH RM).** Provide one as indicated.

2-5.2.1.1 Function: sanitary area for the cleaning of dining dishware and utensils.

2-5.2.1.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.1.3 Finishes:

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: ceramic wall tile

Ceiling: suspended fiberglass panel ceiling.

2-5.2.1.4 Other requirements: Room shall have exterior window. Provide a pair of 914 mm [3'-0"] wide hollow metal doors; door shall have hold open device and entry function.

2-5.2.2 **Kitchen and Bakery Preparation (KITCHEN / BAKERY PREP).** Provide one as indicated.

2-5.2.2.1 Function: sanitary area for food preparation.

2-5.2.2.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

**2-5.2.2.3 Finishes:**

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: ceramic tile

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

**2-5.2.2.4 Other requirements:** Room shall have exterior window. Provide a pair of 914 mm [3'-0"] wide hollow metal passage doors to adjoining Short Order area.

**2-5.2.3 Refrigerator/Freezer Space (REFRIGERATOR/FREEZER).** Provide one as indicated.

**2-5.2.3.1 Function:** Cold storage of food items.

**2-5.2.3.2 Furnishings/Fixtures/Equipment:** See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

**2-5.2.3.3 Finishes:**

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: ceramic tile

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

**2-5.2.4 Pots & Pan Washing (POT & PAN WASHING).** Provide one as indicated.

**2-5.2.4.1 Function:** sanitation area for the cleaning of cooking equipment.

**2-5.2.4.2 Furnishings/Fixtures/Equipment:** See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

**2-5.2.4.3 Finishes:**

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: ceramic tile

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

**2-5.2.5 Pots & Pan Racks (POT & PAN RACKS).** Provide one as indicated.

**2-5.2.5.1 Function:** storage area for cooking equipment.

**2-5.2.5.2 Furnishings/Fixtures/Equipment:** See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

**2-5.2.5.3 Finishes:**

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: ceramic tile

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

**2-5.2.6 Dry Storage (DRY STORAGE).** Provide one as indicated.

2-5.2.6.1 Function: storage space

2-5.2.6.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.6.3 Finishes:

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: ceramic tile

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.2.6.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-5.2.7 **Field Feeding Storage (FIELD FEEDING STORAGE).** Provide one as indicated.

2-5.2.7.1 Function: storage space

2-5.2.7.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.7.3 Finishes:

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: ceramic tile

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.2.7.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-5.2.8 **Ice Machine Room (ICE MACH / COFFEE RM).** Provide one as indicated.

2-5.2.8.1 Function: ice making, beverage, and dessert preparation space.

2-5.2.8.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.8.3 Finishes:

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: ceramic tile

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.2.8.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-5.2.9 **Kitchen Work Area Corridors.** Provide as required.

2-5.2.9.1 Function: Provide as required to allow circulation to kitchen spaces, and comply with applicable code egress requirements.

2-5.2.9.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

**2-5.2.9.3 Finishes:**

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: ceramic tile

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

**2-5.2.10 Receiving (RECEIVING)** Provide as required.

2-5.2.10.1 Function: area for the receipt and temporary storage of equipment and products.

2-5.2.10.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment Catalog Cuts referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

**2-5.2.10.3 Finishes:**

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: ceramic tile

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.2.11 **Electric Panel (ELECT PANEL RM).** Provide one dedicated interior space for electrical equipment. Size and locate rooms to allow equipment removal and maintenance. Provide floor openings and vertical shaft spaces as necessary.

2-5.2.11.1 Function: Electrical support spaces for the Dining Facility.

2-5.2.11.2 Furnishings/Fixtures/Equipment: None.

**2-5.2.11.3 Finishes:**

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: painted gypsum wallboard

Ceiling: painted underside of structure above

2-5.2.11.4 Other requirements: Electrical service to the building shall be underground. Door shall have storeroom function lockset master-keyed to existing system.

2-5.3 **DINING FACILITY ADMINISTRATION AREAS.** Non-Public areas where offices for the facility management occur.

2-5.3.1 **Manager's Office (MGR OFFICE).** Provide one as indicated. Occupants: 1, and occasional visitors.

2-5.3.1.1 Function: Private office for facility manager.

2-5.3.1.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, two side chairs and one desk chair.

**2-5.3.1.3 Finishes:**

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: painted gypsum board

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.3.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Exterior window is desirable. Provide One-Way window in wall between Office and Short Order space.

2-5.3.2 **Office (OFFICE).** Provide one as indicated. Occupants: 1, and occasional visitors.

2-5.3.2.1 Function: Private office

2-5.3.2.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, two side chairs and one desk chair.

2-5.3.2.3 Finishes:

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: painted gypsum board

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.3.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Exterior window is desirable.

2-5.3.3 **Vendor Office (VEN OFF).** Provide one as indicated. Occupants: 1, and occasional visitors.

2-5.3.3.1 Function: Private office

2-5.3.3.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, two side chairs and one desk chair.

2-5.3.3.3 Finishes:

Floor: quarry tile, non-slip finish

Base: quarry tile

Walls: painted gypsum board

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.3.3.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-5.3.4 **Men's Staff Toilet (STAFF TOILET).** Provide one toilet room. Room shall be sized to comply with handicap accessibility requirements. Provide the quantity of lockers and plumbing fixtures as indicated in the table below.

**Table 2-5.3.4 Locker Room Plumbing Fixture and Locker Quantities**

	STAFF TOILET	
	MEN	WOMEN
<b>Lockers</b>	10	10
<b>Toilets</b>	1	2
<b>Urinals</b>	1	-
<b>Lavatories</b>	2	2

2-5.3.4.1 Function: Men's single-occupant toilet and lavatory, for use by staff.

2-5.3.4.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets and wall-hung lavatories; toilet partitions at each toilet; the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser per toilet; one

toilet seat cover dispenser per toilet, robe hook on each toilet partition door; and toilet seat cover dispenser per compartment.

2-5.3.4.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile.

Ceiling: painted gypsum wallboard.

2-5.3.4.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-5.3.5 **Women's Staff Toilet (STAFF TOILET).** Provide one toilet room. Room shall be sized to comply with handicap accessibility requirements. Provide the quantity of lockers and plumbing fixtures as indicated in table 2-6.3.4.

2-5.3.5.1 Function: Women's single-occupant toilet and lavatory, for use by staff.

2-5.3.5.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets and wall-hung lavatories; toilet partitions at each toilet; the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet, robe hook on each toilet partition door; and toilet seat cover dispenser per compartment.

2-5.3.5.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile.

Ceiling: painted gypsum wallboard.

2-5.3.5.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-5.4 **DINING FACILITY SUPPORT AREAS** . Support areas include circulation spaces such as stairs and corridors; mechanical, electrical, storage, and communications spaces. Spaces are as follows:

2-5.4.1 **Can Wash (CAN WASH).** Provide one as indicated

2-5.4.1.1 Function: sanitation area for food products.

2-5.4.1.2 Furnishings/Fixtures/Equipment (FFE): See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.4.1.3 Finishes:

Floor: concrete with hardener and sealer.

Base: none.

Walls: exterior wall material

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.4.2 **Comp. Room (COMP RM).** Provide one as indicated

2-5.4.2.1 Function: mechanical space for refrigerator and freezer conditioning units.

2-5.4.2.2 Furnishings/Fixtures/Equipment (FFE): See RFP Concept Design Drawings-Food Service



Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.4.2.3 Finishes:

Floor: concrete with hardener and sealer.

Base: none.

Walls: painted concrete masonry units

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.4.3.4 Other requirements: Provide pair of 914 mm [3'-0"] wide entry doors.

2-5.4.3 **Extractor Room (EXTRACTOR RM).** Provide one as indicated

2-5.4.3.1 Function: mechanical space.

2-5.4.3.2 Furnishings/Fixtures/Equipment (FFE): See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.4.3.3 Finishes:

Floor: concrete with hardener and sealer.

Base: none.

Walls: painted concrete masonry units

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.4.3.4 Other requirements: Provide pair of 914 mm [3'-0"] wide entry doors.

2-5.4.4 **Loading Dock (LOADING DECK)**

2-5.4.4.1 Function: area for the delivery of equipment and food products.

2-5.4.4.2 Furnishings/Fixtures/Equipment (FFE): None.

2-5.4.4.3 Finishes:

Floor: concrete with hardener and sealer.

Base: none.

Walls: painted concrete masonry units

Ceiling: painted underside of structure.

2-5.4.5 **Hand Wash (HAND WASH).** Area for Dining Facility customers to sanitize themselves before entering the Check-In area of the Dining Facility.

2-5.4.5.1 Function: wash area for Dining Facility customers.

2-5.4.5.2 Furnishings/Fixtures/Equipment (FFE): Provide mechanical systems to comply with applicable codes. The following items will be Contractor furnished and installed: wall-hung hand wash sink (8 stations total)

2-5.4.5.3 Finishes:

Floor: sealed concrete

Base: Exterior wall material on concrete masonry unit.

Walls: Exterior wall material on concrete masonry unit.

Ceiling: Provide painted covered roof structure

2-5.5 **SUPPORT AREAS.** Support areas include circulation spaces such as stairs and corridors; mechanical, electrical, and communication spaces; restroom facilities. Spaces are as follows:

2-5.5.1 **Exterior Corridor.** Refers to an unconditioned, covered circulation space that is enclosed on one long side (adjacent to the building), and has a guardrail on the other side. Provide as required to allow circulation to building spaces and comply with applicable code egress requirements. Exterior corridors provide link to stairs and other circulation components.

2-5.5.1.1 Function: Circulation and means of egress.

2-5.5.1.2 Furnishings/Fixtures/Equipment (FFE): Provide mechanical and electrical systems to comply with applicable codes. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes. All fixtures and equipment shall be suitable for exterior locations.

2-5.5.1.3 Finishes:

Floor: sealed concrete

Base: Exterior wall material

Walls: Exterior wall material

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.5.1.4 Other requirements: Handicap accessible. With the exception of fire sprinkler systems, no piping, conduit or ductwork shall be exposed in exterior corridor. Provide slip resistant finish texture on concrete floor. Guardrails shall be designed in accordance with applicable codes.

2-5.5.2 **Exterior Stairs.** Provide as required to allow circulation to upper floors of the building. Stairs shall comply with applicable code egress requirements. This description covers all Exterior Stairs at for Building 357.

2-5.5.2.1 Function: Circulation and means of egress.

2-5.5.2.2 Furnishings/Fixtures/Equipment (FFE):

2-5.5.2.3 Finishes: Landing floor: sealed concrete with slip-resistant finish texture.

Base: exterior wall material

Treads: Sealed concrete with slip-resistant finish texture. Provide slip-resistant nosing.

Risers: sealed concrete.

Walls: exterior wall materials

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.5.2.4 Other requirements: Stairs shall comply with handicap accessibility requirements of applicable codes. Railings shall be designed in accordance with applicable codes. Refer to Chapter 5 for hardware and security requirements for exterior doors.

2-5.5.3 **Mechanical Areas (MECH).** Provide dedicated interior spaces and exterior areas for plumbing, fire protection, and HVAC equipment. Room shall allow easy equipment removal and maintenance Provide floor openings and vertical shaft spaces as necessary.

2-5.5.3.1 Function: Mechanical support spaces for the UEPH building.

2-5.5.3.2 Furnishings/Fixtures/Equipment: None.

2-5.5.3.3 Finishes:

Floor: sealed concrete

Base: resilient cove base

Walls: painted gypsum wallboard or painted concrete masonry units

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.5.3.4 Other requirements: Locate air intake and exhaust openings to provide optimum indoor air quality. Roof mounted equipment shall not be used. Provide masonry screen walls with lockable metal access gates around outdoor equipment areas (refer to Chapter 3); comply with force protection standards. Doors shall have storeroom function locksets master-keyed to existing systems.

2-5.5.4 **Electrical Rooms (ELEC).** Provide dedicated interior spaces and exterior areas for electrical equipment. Allow equipment removal and maintenance. Provide floor openings and vertical shaft spaces as necessary.

2-5.5.4.1 Function: Electrical support spaces for the UEPH building.

2-5.5.4.2 Furnishings/Fixtures/Equipment: None.

2-5.5.4.3 Finishes:

Floor: sealed concrete

Base: resilient cove base

Walls: painted gypsum wallboard or painted concrete masonry units

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.5.4.4 Other requirements: Electrical service to the building shall be underground. Door shall have storeroom function lockset master-keyed to existing systems..

2-5.5.5 **Telecommunication Room (TELE & COMM).** Provide dedicated interior rooms for communication equipment. Room shall allow easy equipment removal and maintenance. Provide minimum of two communication room per floor.

2-5.5.5.1 Function: Telephone and data network support spaces for the UEPH building.

2-5.5.5.2 Furnishings/Fixtures/Equipment: None.

2-5.5.5.3 Finishes:

Floor: vinyl composition tile

Base: resilient cove base

Walls: painted gypsum wallboard, or painted concrete masonry units

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.5.5.4 Other requirements: Communication service to the building shall be underground. Provide minimum 914 mm [3'-0"] wide door with storeroom function lockset master-keyed to existing systems.. Provide floor openings and vertical shaft spaces as necessary. Provide a minimum of three 102 mm [4"] diameter empty conduits between vertically stacked communication rooms.

2-5.5.6 **Men's Public Toilet (MEN).** Provide one toilet room on the ground floor. Room shall be sized to comply with handicap accessibility requirements. Provide the quantity of plumbing fixtures as indicated in table 2-6.5.6.

**Table 2-5.5.6 Toilet Room Plumbing Fixture Quantities**

	PUBLIC TOILET	
	MEN	WOMEN
<b>Toilets</b>	2	3
<b>Urinals</b>	1	-
<b>Lavatories</b>	3	3

2-5.5.6.1 Function: Men's single-occupant toilet and lavatory, for use by staff and visitors.

2-5.5.6.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets and wall-hung lavatories; toilet partitions at each toilet; the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet, robe hook on each toilet partition door; and toilet seat cover dispenser per compartment.

2-5.5.6.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile.

Ceiling: painted gypsum wallboard.

2-5.5.6.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-5.5.7 **Women's Public Toilet (WOMEN).** Provide one toilet room on the ground floor. Room shall be sized to comply with handicap accessibility requirements. Provide the quantity of plumbing fixtures as indicated in table 2-6.5.6.

2-5.5.7.1 Function: Women's single-occupant toilet and lavatory, for use by staff and visitors.

2-5.5.7.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets and wall-hung lavatories; toilet partitions at each toilet; the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet, robe hook on each toilet partition door; and toilet seat cover dispenser per compartment.

2-5.5.7.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile.

Ceiling: painted gypsum wallboard.

2-5.5.7.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

**2-6 BUILDING 357 - SOLDIER SERVICES FUNCTIONAL AND AREA REQUIREMENTS.** Soldier services occur on the second floor of Building 357. Soldier services are unrelated to other battalion administration functions.

2-6.1 **SOLDIER SUPPORT SERVICES.** Spaces covered under this paragraph shall be made accessible for handicapped persons in accordance with Chapter 5, paragraph 5-9.

2-6.1.1 **Chaplain (CHAP).** Provide four on the second floor. Occupants: 1, and visitors.

2-6.1.1.1 Function: Private office for Chaplain and visitors.

2-6.1.1.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, four side chairs, and one desk chair.

## 2-6.1.1.3 Finishes:

Floor: carpet

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-6.1.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.1.2 **Chaplain's Assistant (ASST CHAP).** Provide four on the second floor. Occupants: 1, and visitors.

2-6.1.2.1 Function: Private office for Chaplain's Assistant and visitors.

2-6.1.2.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two side chairs, and one desk chair.

## 2-6.1.2.3 Finishes:

Floor: carpet

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-6.1.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.1.3 **Chaplain Waiting (WAITING).** Provide as indicated on the second floor.

2-6.1.3.1 Function: waiting area for visitors to Chaplain services.

2-6.1.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: eight side chairs, two end tables, and magazine rack.

## 2-6.1.3.3 Finishes:

Floor: carpet

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-6.1.4 **Toilet (TOILET).** Provide as indicated on the second floor. Occupants: 1, and visitors.

2-6.1.4.1 Function: single-occupant toilet and lavatory, for use by staff.

2-6.1.4.2 Furnishings/Fixtures/Equipment: The following items will be Contractor furnished and installed: floor mounted toilet and wall-hung lavatory; the following toilet accessories: one mirror with shelf; one paper towel dispenser/waste receptacle; one soap dispenser; one toilet tissue dispenser; one toilet seat cover dispenser, robe hook on door; and toilet seat cover dispenser.

## 2-6.1.4.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile wainscot 1219 mm high with painted water-resistant gypsum board above.

Ceiling: painted gypsum wallboard.

2-6.1.4.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.1.5 **Legal Office (LEGAL).** Provide four on the second floor.

2-6.1.5.1 Function: Private office.

2-6.1.5.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair and one desk chair.

2-6.1.5.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-6.1.5.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-6.1.3 **Legal Waiting (WAITING).** Provide as indicated on the second floor.

2-6.1.3.1 Function: waiting area for visitors to Chaplain services.

2-6.1.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: eight side chairs, two end tables, and magazine rack.

2-6.1.3.3 Finishes:

Floor: carpet

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-6.2 **TROOP AID STATION.** Spaces covered under this paragraph, with the exception of Storage Spaces shall be made accessible for handicapped persons in accordance with Chapter 5, paragraph 5-9.

2-6.2.1 **Medical Office (Med Office)**

2-6.2.1.1 Function: open office area.

2-6.2.1.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: four desks with return, four bookcase, four legal-size four-drawer file cabinets, eight side chair and four desk chairs.

2-6.2.1.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-6.2.1.4 Other requirements: Provide historic doors as required. Room shall have exterior window.

2-6.2.2 **Doctor's Office (DR. OFF.)**

2-6.2.2.1 Function: Private office.

2-6.2.2.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair and one desk chair.

2-6.2.2.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-6.2.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Room shall have exterior window.

2-6.2.3 **Non-Commissioned Officer In Charge (NCOIC)**

2-6.2.3.1 Function: Private office.

2-6.2.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair and one desk chair.

2-6.2.3.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-6.2.3.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.2.4 **Physician's Assistant (PHY ASST)**

2-6.2.4.1 Function: Private office.

2-6.2.4.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair and one desk chair.

2-6.2.4.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-6.2.4.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.2.5 **Working Storage (WORKING STOR)**

2-6.2.5.1 Function: Storage space.

2-6.2.5.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: portable shelving.

2-6.2.5.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.2.5.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.2.6 **Deployment Storage (DEPLOY STOR)**

2-6.2.6.1 Function: Storage space.

2-6.2.6.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: portable shelving.

2-6.2.6.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.2.6.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.3 **SOLDIER COMMUNITY FUNCTIONS.** Soldier Community areas are social gathering and recreational spaces. It includes functions like mail boxes, kitchen, and office space. These areas provide a place for relaxation and social interaction in an informal setting. Spaces covered under this paragraph, with the exception of office, front desk, mailroom, janitor's closet, and storage rooms, shall be made accessible for handicapped persons in accordance with Chapter 5, paragraph 5-9.

2-6.3.1 **Activity (ACTIVITY)** Provide one on the second floor.

2-6.3.1.1 Function: Soldier entertainment area.

2-6.3.1.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: seating for up to 25 occupants, game machines, and billiard table.

2-6.3.1.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.1.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room.

2-6.3.2 **Seating Area (SEATING AREA)** Provide one on the second floor.

2-6.3.2.1 Function: entertainment area for Soldiers' and visitors.

2-6.3.2.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: seating for up to 25 occupants.

2-6.3.2.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard.



Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.2.4 Other requirements: Provide 1829 mm [6'-0"] wide doors into room.

2-6.3.3 **TV Lounge (TV LOUNGE)** Provide one on the second floor.

2-6.3.3.1 Function: entertainment area for Soldiers' and visitors.

2-6.3.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: seating for up to 25 occupants, large screen television, videotape and DVD player.

2-6.3.3.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.3.4 Other requirements:

2-6.3.4 **Kitchen (KITCHEN)** Provide one on the second floor.

2-6.3.4.1 Function: Soldier cooking area.

2-6.3.4.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one refrigerator-freezer (minimum 9 total cubic feet); one microwave oven (min .9 cubic feet, 800 watts) mounted under wall cabinets; one dining table for two persons, 750mm square x 725mm high [30" x 28-1/2" high] with two armless dining chairs; one 4-burner electric range with self-cleaning oven.

The following items will be Contractor furnished and installed: ; one range hood with exterior exhaust; provide 600mm [2'-0"] deep kitchen base cabinets and countertop in the amount as indicated on the Concept Design Drawing , and 3658 linear mm [12'-0"] of 300mm [12"] deep wall cabinets at interior wall. Wall cabinets shall be minimum 600mm [2'-0"] high; provide 600 mm [2'-0"] clear between countertop and bottom of wall cabinets. Base cabinets shall have minimum of two 300 mm [12"] wide drawers. Provide plastic laminate countertop with integral side and backsplashes at walls. Provide single compartment, stainless steel kitchen sink with food strainer/stopper, minimum inside dimensions 400mm x 400mm x 175mm deep [1'-4" x 1'-4" x 7" deep], with chrome-plated, single handle, washerless mixing faucet (refer to Chapter 8). Provide fire extinguisher mounted above base cabinet.

2-6.3.4.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.4.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room.

2-6.3.5 **Vending Area (VENDING).** Provide minimum one area on the second floor..

2-6.3.5.1 Function: Space for soft drink and snack vending machines, and ice machine-dispenser.

2-6.3.5.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one ice cube machine-dispenser designed for hotel ice bucket filling, capable of producing minimum 250 lbs. of regular ice cubes in 24 hours, with 180 lb. Storage; ice machine manufacturer's automatic cleaning system to clean and sanitize the water distribution system of the machine at scheduled intervals. Ice machine shall be Energy Star compliant; four full-size soft drink and snack vending machines.

Vending machines will not require plumbing connections.

2-6.3.5.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.5.4 Other requirements: Provide electrical power to accommodate vending machines and to comply with applicable codes.

2-6.3.6 **Office (OFFICE).** Provide one on the second floor. Room shall be accessed through the Front Desk. Occupants: 1

2-6.3.6.1 Function: Private office for manager.

2-6.3.6.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, two side chairs and one desk chair.

2-6.3.6.3 Finishes:

Floor: carpet

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-6.3.6.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.3.7 **Front Desk (FRONT DESK).** Provide one on the second floor. Occupants: 1, and occasional visitors.

2-6.3.7.1 Function: Visual Control of entrances, exits, and Soldier Community Functional Areas.

2-6.3.7.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one legal-size four-drawer file cabinets, one desk chair. The following items will be Contractor furnished and installed: Provide counter (built-in casework), per Concept Design Drawings, separating the Front Desk from the Sitting Room Corridor. The counter on the corridor side shall be minimum 1016 mm [3'-4"] high x 305 mm [12"] deep. The counter on the Front Desk side shall be minimum 762 mm [2'-6"] high x 610 mm [2'-0"] deep. The desk shall accommodate computer and monitor (not in contract), and writing area. Provide task lighting at all writing surfaces. Provide built-in communication and power receptacles or grommets in desk top to access wall receptacles. Desk shall have knee space and minimum two cabinets with hinged doors, and two drawers. Drawers and cabinets shall have keyed locks. Desk components shall have plastic laminate countertop, drawer, and door fronts.

2-6.3.7.3 Finishes:

Floor: carpet

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.7.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.3.8 **Public Telephone Area (PHONES).** Provide one on the second floor.

2-6.3.8.1 Function: Pay telephones for barracks occupants and visitors.

2-6.3.8.2 Furnishings/Fixtures/Equipment: The following items will be Contractor furnished and installed: three pay telephones and telephone stations. Offeror shall contract with local telephone company or other telephone service provider to furnish and install pay telephones; rate charged for calls shall not exceed the average prevailing rate in the local off-post community. Each station will have divider panels to enhance acoustical privacy. Provide built-in seating at two stations; third station shall be wheelchair accessible. Provide capability to mount portable TDD at one station. Materials shall be vandal resistant and easily cleaned.

2-6.3.8.3 Finishes: Match Sitting Room.

2-6.3.8.4 Other requirements: Handicap accessible.

2-6.3.9 **Mail Room (MAIL ROOM).** Provide one on the second floor. Room shall be sized to allow access to all rear-loading mailboxes and parcel lockers. Provide minimum 1829 mm [6'-0"] clear between back of mailboxes and any obstructions. To comply with force protection minimum standards, avoid routing key utilities (including communications, fire detection and alarm, water mains, etc.) through or on common walls to mail room.

2-6.3.9.1 Function: Secure area for sorting incoming mail and distributing to rear-loading mailboxes.

2-6.3.9.2 Furnishings/Fixtures/Equipment: The following items will be Contractor furnished and installed: Provide plastic laminate-faced sorting counter (built-in casework) 762 mm [2'-6"] deep x 914 mm [3'-0"] high and length as indicated on Concept Design Drawings. Provide United States Postal Service approved mailbox for each resident of the facility. Provide minimum of nine parcel lockers, and one outgoing mail collection box.

2-6.3.9.3 Finishes:

Floor: vinyl composition tile

Base: resilient cove base

Walls: painted gypsum wallboard

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.9.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Room shall be handicap accessible. Design shall comply with United States Postal Service regulations.

2-6.3.10 **Common Toilet (T).** Provide two toilet rooms on the second floor within the Soldier Community space. Room shall be sized to comply with handicap accessibility requirements.

2-6.3.10.1 Function: Men's single-occupant toilet and lavatory, for use by staff and visitors.

2-6.3.10.2 Furnishings/Fixtures/Equipment (FFE): the following items will be Contractor furnished and installed: Provide floor mounted toilets and wall-hung lavatories. Provide toilet partitions at each toilet. Provide the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser; one toilet seat cover dispenser per toilet, robe hook on each toilet partition door.

2-6.3.10.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile wainscot 1219 mm high with painted water-resistant gypsum board above.

Ceiling: painted gypsum wallboard.

2-6.3.10.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-6.3.11 **Janitor Closet (JAN).** Provide three on the second floor. Rooms shall be accessed from Seating Area and COF Toilet/Shower.

2-6.3.11.1 Function: Sink and storage of cleaning supplies, soap, and paper products.

2-6.3.11.2 Furnishings/Fixtures/Equipment (FFE): Provide one floor mounted mop sink, mop rack for three mops, and minimum 1524 linear mm of wall mounted stainless steel shelving.

2-6.3.11.3 Finishes:

Floor: vinyl composition tile

Base: resilient cove base

Walls: painted water-resistant gypsum wallboard

Ceiling: painted gypsum wallboard

2-6.3.12 **Storage (ST).** Provide one on the second floor. Room shall be accessed from Seating Area.

2-6.3.12.1 Function: storage.

2-6.3.12.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Government furnished and installed: portable shelving.

2-6.3.12.3 Finishes:

Floor: vinyl composition tile

Base: resilient cove base

Walls: painted gypsum wallboard

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.4 **Classroom Areas.** Provide one group of classrooms on the second and third floor of Building 357. Classrooms will be accessed from the exterior corridor (Lanai).

2-6.4.1 **Classroom (CLASSROOM).** Each classroom allows direct access from the exterior corridor (Lanai), and direct egress out of the building.

2-6.4.1.1 Function: Soldier training and other meetings.

2-6.4.1.2 Furnishings/Fixtures/Equipment: None.

2-6.4.1.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.4.1.4 Other requirements: Provide pair of 914 mm [3'-0"] wide Historic doors as required.

## 2-7 **BUILDING 357 - BATTALION HEADQUARTERS (HQ) FUNCTIONAL AND AREA**

**REQUIREMENTS.** One Large Battalion HQ is located on the third floor of Building 357. The Battalion HQ shall consist of administrative areas, classrooms, and support spaces. A portion of the Battalion HQ functions will occur on the second floor of Building 357; specifically, they are the soldier support services (chaplain and legal) areas, and troop aid station. One elevator is required for Building 357. Mechanical and electrical systems must provide the battalion with independent operation and control.

Leadership and staff will manage the organization, receive visitors, and conduct the business of the battalion from the administrative areas (Command section, S-1, S-2, S-3, and S-4). Soldiers will visit the facility to conduct administrative business, or attend training classes. Military personnel will staff the facility; military and non-military personnel will visit the facility to meet with leadership or attend meetings. Although only able-bodied military personnel will be on staff, all spaces except shower rooms, and utility areas (janitor closets, mechanical, electrical, communication, and elevator machine rooms) shall comply with handicapped accessibility requirements, see Chapter 5, paragraph 5-9. Functions and areas are as follows:

2-7.1 **Command Section.** Provide one group of offices on the third floor, with accompanying administration area and reception area.

2-7.1.1 **Commanding Officer (CO).** Provide one on the third floor. Occupants: 1, and occasional visitors.

2-7.1.1.1 Function: Private office for battalion commanding officer.

2-7.1.1.2 Furnishings/Fixtures/Equipment: The following items shall Government furnished and installed: one desk, one credenza, one bookcase, two legal-size four-drawer file cabinets, one conference table, six side chairs, and one desk chair.

2-7.1.1.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Room shall have exterior window.

2-7.1.2 **Executive Officer (XO).** Provide one on the third floor. Occupants: 1, and occasional visitors.

2-7.1.2.1 Function: Private office for battalion executive officer.

2-7.1.2.2 Furnishings/Fixtures/Equipment: The following items shall Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.1.2.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.1.3 **Command Sergeant Major (CSM).** Provide one on the third floor. Occupants: 1, and occasional visitors.

2-7.1.3.1 Function: Private office for battalion command sergeant major.

2-7.1.3.2 Furnishings/Fixtures/Equipment: The following items shall Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair, and one desk chair.

**2-7.1.3.3 Finishes:**

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

**2-7.1.3.4 Other requirements:** Provide 914 mm [3'-0"] wide door into room.

**2-7.1.4 Duty Officer (DUTY OFF).** Provide one on the third floor. Occupants: 1.

**2-7.1.4.1 Function:** Duty Officer will provide physical security of the building, and visual control of the entrances and lobby, as well as functioning as an information source for visitors.

**2-7.1.4.2 Furnishings/Fixtures/Equipment:** The following items shall Government furnished and installed: one desk with return, one legal-size four-drawer file cabinet, one side chair, and one desk chair.

**2-7.1.4.3 Finishes:**

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

**2-7.1.4.4 Other requirements:** Provide 914 mm [3'-0"] wide door into room; door shall have glass vision panel.

**2-7.1.5 Message Mail Center (MESS CTR).** Provide one on the third floor.

**2-7.1.5.1 Function:** Mail sorting.

**2-7.1.5.2 Furnishings/Fixtures/Equipment:** The following item will be Contractor furnished and installed: counter (built-in casework), as indicated in the Concept Design Drawings, separating the Message Mail Center from the corridor. The counter on the corridor side shall be minimum 1524 mm [5'-0"] wide x 1016 mm [3'-4"] high x 305 mm [12"] deep; provide locking overhead roll-down door to secure the opening when unattended; roll-down door hood shall not be visible from corridor side. Counter material shall be plastic laminate

**2-7.1.5.3 Finishes:**

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

**2-7.1.5.4 Other requirements:** Provide 914 mm [3'-0"] wide door into room; door shall have entry function lockset and glass vision panel.

**2-7.1.6 Reception (RECEPT).** Provide one on the third floor. Accommodates reception desk and waiting area.

**2-7.1.6.1 Function:** Control area for visitors

**2-7.1.6.2 Furnishings/Fixtures/Equipment:** The following items will be Contractor furnished and installed: Provide counter (built-in casework), as indicated in the Concept Design Drawings, separating the reception area from the control/waiting area. The counter on the corridor side shall be minimum 1524 mm [5'-0"] wide

x 1016 mm [3'-4"] high x 305 mm [12"] deep; the counter on the Reception side shall be minimum 762 mm [2'-6"] high x 610 mm [2'-0"] deep. The desk shall accommodate computer and monitor (not in contract), and writing area. Provide built-in communication and power receptacles or grommets in desk top to access wall receptacles. Desk shall have knee space and minimum two cabinets with hinged doors, and two drawers. Drawers and cabinets shall have keyed locks. Desk components shall have plastic laminate countertop, drawer, and door fronts.

2-7.1.6.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.6.4 Other requirements: Provide 914 mm [3'-0"] wide door into room; door shall have entry function lockset and glass vision panel.

2-7.1.7 **Conference Room (CONF RM).** Provide two on the third floor. Room shall be located to allow direct access from the Command Section/S-1 Section and CO Office. The conference rooms shall be divided by operable panel partitions and provided with appropriate entrances and exits to allow two rooms to be combined for use as one large classroom. Occupants: up to 26 persons.

2-7.1.7.1 Function: Conference room for battalion leadership, staff, and visitors. Functions will include staff meetings, hearings, disciplinary sessions, and training.

2-7.1.7.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: conference table and seating for up to 26 persons. Provide one marker board (minimum 2438 mm wide x 1219 mm high [8'-0" x 4'-0"]). The following item will be Contractor furnished and installed: recessed ceiling mounted, motorized projection screen; 2438 mm wide [8'-0"]; operable partition.

2-7.1.7.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.7.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room.

2-7.1.8 **Coffee Area (COFFEE).** Provide one on the third floor. Area shall have countertop with kitchen sink; comply with handicap accessibility requirements.

2-7.1.8.1 Function: Sink and space for coffee maker and supplies; for use by command section staff and visitors.

2-7.1.8.2 Furnishings/Fixtures/Equipment (FFE): the following items will be Contractor furnished and installed: Provide 610 mm deep [2'-0"] plastic laminate countertop by width (see Concept Design Drawings) with integral side and backsplash, single compartment stainless steel kitchen sink 457 x 457 x 203 mm deep [18" x 18" x 8"]. Provide 330 mm deep [13"] of wall cabinets; mounted to provide 610 mm clearance above countertop. Provide dedicated electrical receptacle for coffee maker.

2-7.1.8.3 Finishes:

Floor: vinyl composition tile.

Base: resilient base.

Walls: painted gypsum wallboard.

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.9 **Command Section Private Toilet (TOIL).** Provide one private toilet room on the third floor S-1 Administration area. Room shall be sized to comply with handicap accessibility requirements. Room shall be accessed from Administrative Area Corridor.

2-7.1.9.1 Function: Uni-sex single-occupant toilet and lavatory; for use by staff and visitors.

2-7.1.9.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: one floor mounted toilet, one wall-hung lavatory with fixtures and fittings, mirror with shelf above lavatory, paper towel dispenser/waste receptacle, soap dispenser, toilet tissue dispenser, and one toilet seat cover dispenser.

2-7.1.9.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile wainscot 1219 mm high with painted water-resistant gypsum board above.

Ceiling: painted gypsum wallboard.

2-7.1.9.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-7.1.10 **Storage (ST).** Provide one on the third floor.

2-7.1.10.1 Function: storage

2-7.1.10.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: portable shelving.

2-7.1.10.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.10.4 Other requirements: provide 914 mm [3'-0"] wide door into room.

2-7.2 **S-1 Section.** Provide one group of offices on the third floor. Command Section shall be accessed through the S-1 Clerical/Central Files area.

2-7.2.1 **S-1 Officer (S-1 OFF).** Provide one on the third floor. Room shall be accessed through the S-1 Clerical/Central Files area. Occupants: 1, and occasional visitors.

2-7.2.1.1 Function: Private office for S-1 officer.

2-7.2.1.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.2.1.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.



2-7.2.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.2.2 **S-1 Clerical/Central Files (S-1).** Provide one on the third floor. S-1 Clerical/Central Files shall be accessed from the exterior corridor. The area shall have direct access to S-1 and Command Section private offices, and reception area. Occupants: 7 staff and occasional visitors.

2-7.2.2.1 Function: Open office area for S-1 admin staff; access to S-1 and Command offices.

2-7.2.2.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: seven systems furniture workstations.

2-7.2.2.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.2.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Exterior window is desirable.

2-7.3 **Personnel and Administration Center (PAC)** Provide one group of offices on the third floor.

2-7.3.1 **PAC (OFF).** Provide one on the third floor. Room shall be accessed through the PAC Open Office area. Occupants: 1, and occasional visitors.

2-7.3.1.1 Function: Private office for PAC officer.

2-7.3.1.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.3.1.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.3.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.3.2 **PAC Clerical/Central Files (PAC).** Provide one on the third floor. PAC Clerical/Central Files shall be accessed from the Reception Area. Occupants: 7 staff and occasional visitors.

2-7.3.2.1 Function: Open office area for PAC admin staff.

2-7.3.2.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: seven systems furniture workstations.

2-7.3.2.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.3.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.4        **S-2 SECTION.** Provide one group of offices on the third floor. In a two-story building locate S-2 Section on the second floor.

2-7.4.1        **S-2 Officer (OFF).** Provide one on the third floor. Room shall be accessed through the S-2 Clerical/Central Files area. Occupants: 1, and occasional visitors.

2-7.4.1.1      Function: Private office for S-2 officer.

2-7.4.1.2      Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.4.1.3      Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard or painted veneer plaster

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.4.1.4      Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.4.2        **Crypto Storage (CRYPTO).** Provide one on the third floor.

2-7.4.2.1      Function: storage

2-7.4.2.2      Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: portable shelving.

2-7.4.2.3      Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.4.2.4      Other requirements: provide 914 mm [3'-0"] wide door into each room.

2-7.4.3        **S-2 Clerical/Central Files (S-2).** Provide one on the third floor. S-2 Clerical/Central Files shall be accessed from the lobby or corridor. The area shall have direct access to S-2 private offices, and the Secured Documents Vault. Occupants: 8 staff , and occasional visitors.

2-7.4.3.1      Function: Open office area for S-2 admin staff; access to other S-2 space.

2-7.4.3.2      Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: eight systems furniture workstations.

2-7.4.3.3      Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.4.3.4      Other requirements: Provide 914 mm [3'-0"] wide door into room. Exterior window is desirable. Minimum ceiling height 2642 mm [8'-8"].

2-7.4.4        **S-2 Storage (ST).** Provide one on the third floor.

2-7.4.4.1 Function: storage

2-7.4.4.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: portable shelving.

2-7.4.4.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.4.4.4 Other requirements: provide 914 mm [3'-0"] wide door into each room.

2-7.5 **S-3 SECTION.** Provide one group of offices on the third floor.

2-7.5.1 **S-3 Officer (OFF).** Provide one on the third floor. Room shall be accessed through the S-3 Clerical/Central Files area. Occupants: 1, and occasional visitors.

2-7.5.1.1 Function: Private office for S-3 officer.

2-7.5.1.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: one desk with return , one bookcase , two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.5.1.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.5.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Room shall have exterior window.

2-7.5.2 **S-3 Clerical/Central Files (S-3).** Provide one on the third floor. The area shall have direct access to S-3 private offices. Occupants: 8 staff , and occasional visitors.

2-7.5.2.1 Function: Open office area for S-3 admin staff; access to S-3 office.

2-7.5.2.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: eight systems furniture workstations.

2-7.5.2.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.5.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.6 **S-4 SECTION.** Provide one group of offices on the third floor. In a two-story building locate S-4 Section on the first floor.

2-7.6.1 **S-4 Officer (OFF).** Provide one on the third floor. Room shall be accessed through the S-4

Clerical/Central Files area. Occupants: 1, and occasional visitors.

2-7.6.1.1 Function: Private office for S-4 officer.

2-7.6.1.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: one desk with return , one bookcase , two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.6.1.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.6.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Room shall have exterior window.

2-7.6.2 **S-4 Clerical/Central Files (S-4).** Provide one on the third floor. S-4 Clerical/Central Files shall be accessed from the lobby or corridor. The area shall have direct access to S-4 private offices. Occupants: 8 staff , and occasional visitors.

2-7.6.2.1 Function: Open office area for S-4 admin staff; access to S-4 office.

2-7.6.2.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: eight systems furniture workstations.

2-7.6.2.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.6.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.6.3 **S-4 Storage & Supplies (SUPP).** Provide one on the third floor. Room shall be under control of, and accessed from, S-4/Clerical/Central Files area.

2-7.6.3.1 Function: Storage of miscellaneous equipment for S-4 Section.

2-7.6.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: portable shelving.

2-7.6.3.3 Finishes:

Floor: vinyl composition tile

Base: resilient cove base

Walls: painted gypsum wallboard or

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.6.3.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.7 **S-6 SECTION.** Provide one group of offices on the third floor.

2-7.7.1 **S-6 Officer (OFF).** Provide one on the third floor. Room shall be accessed through the S-6 Clerical/Central Files area. Occupants: 1, and occasional visitors.

2-7.7.1.1 Function: Private office for S-6 officer.

2-7.7.1.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: one desk with return , one bookcase , two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.7.1.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.7.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.7.2 **S-6 Clerical/Central Files (S-6).** Provide one on the third floor. The area shall have direct access to S-6 private offices. Occupants: 8 staff , and occasional visitors.

2-7.7.2.1 Function: Open office area for S-6 admin staff; access to S-6 office.

2-7.7.2.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: eight systems furniture workstations.

2-7.7.2.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.7.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.8 **Equal Opportunity Office (EO).** Provide one on the third floor. Room shall be accessed through the exterior corridor (Lanai). Occupants: 1, and occasional visitors.

2-7.8.1 Function: Private office EO officer.

2-7.8.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: one desk with return , one bookcase , two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.8.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.8.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.9 **Siprnet Room (SIPRNET).** Provide a Siprnet Room on the third floor. The construction of the Siprnet Room shall be similar to that of the Arms Vault, see paragraph 5-7.2. Coordinate with the authority having jurisdiction for specific construction requirements. See SOW Ch 9 Electrical Systems, para. 9-2.6 for additional requirements regarding this space.

2-7.9.1 Function: Telecommunications vault for classified information.

2-7.9.2 Furnishings/Fixtures/Equipment: None.

2-7.9.3 Finishes:

Floor: sealed concrete

Base: none.

Walls: painted concrete.

Ceiling: painted concrete.

2-7.9.4 Other requirements: Provide 914 mm [3'-0"] wide hollow metal door into room.

2-7.10 **CLASSROOM AREAS.** Provide one group of classrooms for the battalion on the third floor of Building 357. Classrooms will be accessed from an interior corridor or exterior corridor (Lanai). The Classroom/L.R.C. and Classroom No. 2 shall be divided by operable panel partitions and provided with appropriate entrances and exits to allow two rooms to be combined for use as one large classroom.

2-7.10.1 **Classroom/Learning Resource Center (CLASSRM L.R.C.).** Each classroom shall be located to allow direct access from the main corridor/lobby, and direct egress out of the building. Occupants: up to 60 persons in each room.

2-7.10.1.1 Function: Soldier training and other meetings.

2-7.10.1.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: tables and chairs for up to 60 occupants; one lectern; one marker board (minimum 3658 mm wide x 1219 mm high [12'-0" x 4'-0"]) and one 2438 mm wide [8'-0"]

The following items will be Contractor furnished and installed: wall separating Classroom/L.R.C. and Classroom No.2 shall be operable panel partition with minimum STC rating as indicated in SOW Ch. 5. Provide recessed ceiling mounted, motorized projection screen; 2438 mm wide [8'-0"]; operable partition. Coordinate with user and add requirements for cable television outlets, television support brackets, or other equipment.

2-7.10.1.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.10.1.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room.

2-7.10.2 **Classroom No. 2 (CLASSRM No. 2).** Each classroom shall be located to allow direct access from the main corridor/lobby, and direct egress out of the building. Occupants: up to 60 persons in each room.

2-7.10.2.1 Function: Soldier training and other meetings.

2-7.10.2.2 Furnishings/Fixtures/Equipment: The room shall accommodate tables and chairs for up to 60 occupants; one lectern. Walls separating classrooms shall be operable panel partitions with minimum STC rating as indicated in SOW Ch. 5. Provide one marker board (minimum 3658 mm wide x 1219 mm high [12'-0" x 4'-0"]) and one 2438 mm wide [8'-0"] wall mounted pull-down projection screen. Coordinate with user and add requirements for cable television outlets, television support brackets, or other equipment; identify whether equipment is to be contractor or government provided.

2-7.10.2.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.10.2.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room. Minimum ceiling height 2642 mm [8'-8"] at perimeter, 3048 mm [10'-0"] in main portion of room.

2-7.10.3 **Classroom No. 1 (CLASSRM No. 1).** Each classroom shall be located to allow direct access from the main corridor/lobby, and direct egress out of the building. Occupants: up to 60 persons in each room.

2-7.10.3.1 Function: Soldier training and other meetings.

2-7.10.3.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: tables and chairs for up to 60 occupants; one lectern; one marker board (minimum 3658 mm wide x 1219 mm high [12'-0" x 4'-0"]) and one 2438 mm wide [8'-0"]

The following items will be Contractor furnished and installed: Provide recessed ceiling mounted, motorized projection screen; 2438 mm wide [8'-0"]. Coordinate with user and add requirements for cable television outlets, television support brackets, or other equipment.

2-7.10.3.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.10.3.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room.

2-7.10.4 **Resource Center (RESOURCE CTR).** Each classroom shall be located to allow direct access from the main corridor/lobby, and direct egress out of the building. Occupants: up to 60 persons in each room.

2-7.10.4.1 Function: Soldier training and other meetings.

2-7.10.4.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: tables and chairs for up to 60 occupants; one lectern; one marker board (minimum 3658 mm wide x 1219 mm high [12'-0" x 4'-0"]) and one 2438 mm wide [8'-0"]

The following items will be Contractor furnished and installed: Provide recessed ceiling mounted, motorized projection screen; 2438 mm wide [8'-0"]. Coordinate with user and add requirements for cable television outlets, television support brackets, or other equipment.

2-7.10.4.3 Finishes:

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.10.4.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room.

2-7.11 **Re-Enlist Office (RE-ENLIST).** Provide one on the third floor. Room shall be accessed from the exterior corridor. Occupants: 1, and occasional visitors.

2-7.11.1 Function: Private office for re-enlistment personnel.

2-7.11.2     **Furnishings/Fixtures/Equipment:** the following item will be government furnished and installed: one desk with return , one bookcase , two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.11.3     **Finishes:**

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard

Ceiling: Suspended acoustic tile ceiling grid system.

2-7.11.4     **Other requirements:** Provide 914 mm [3'-0"] wide door into room.

2-7.12        **Battalion HQ Common Areas.** Provide the following Common areas for the Battalion HQ. Handicapped accessibility is required in all common areas except janitor closet and shower rooms.

2-7.12.1     **Lobby, Corridors, and Vestibules.** Provide as required to allow access to building spaces. Unless otherwise required, minimum width of main corridors providing access to classroom area shall not be less than 2438 mm [8'-0"]; minimum width of other main corridors shall not be less than 1829 mm [6'-0"]. Corridor width shall comply with applicable egress codes.

2-7.12.1.1   **Function:** Entry to the facility; egress and circulation through the building.

2-7.12.1.2   **Furnishings/Fixtures/Equipment:** the following items will be Contractor furnished and installed: wall mounted electric water cooler. Provide mechanical and electrical systems to comply with applicable codes. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes. Provide interior signage to identify major spaces. Provide one building directory near each main entrance and one building directory near first floor elevator doors. The following item will be Government furnished and installed: Provide one 1219 mm high x 1829 mm wide [4'-0" x 6'-0"] wall mounted bulletin board.

2-7.12.1.3   **Finishes:**

Floor: vinyl composition tile

Base: resilient cove base.

Walls: painted gypsum wallboard

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-7.12.1.4   **Other requirements:** Handicap accessible.

2-7.12.2     **Vending Area (VENDING).** Provide minimum one area on the third floor..

2-7.12.2.1   **Function:** Space for soft drink and snack vending machines, and ice machine-dispenser.

2-7.12.2.2   **Furnishings/Fixtures/Equipment:** The following items will be Government furnished and installed: one ice cube machine-dispenser designed for hotel ice bucket filling, capable of producing minimum 250 lbs. of regular ice cubes in 24 hours, with 180 lb. Storage; ice machine manufacturer's automatic cleaning system to clean and sanitize the water distribution system of the machine at scheduled intervals. Ice machine shall be Energy Star compliant; four full-size soft drink and snack vending machines. Vending machines will not require plumbing connections.

2-7.12.2.3   **Finishes:**

Floor: vinyl composition tile

Base: resilient base

Walls: painted gypsum wallboard.

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.



2-7.12.2.4 Other requirements: Provide electrical power to accommodate vending machines and to comply with applicable codes.

**2-7.13 Command Section Common Locker/Shower Areas (BATTALION TOILET/SHOWER).**

Provide one group of men's and one group of women's common locker/shower area on the third floor of Building 357. Provide the quantity of lockers and fixtures as indicated in the table below. Handicapped accessibility is not required. Exterior entrance vestibules shall be provided. Entrances shall provide visual privacy into the spaces.

**Table 2-7.13 Locker Room Plumbing Fixture and Locker Quantities**

	BATTALION HQ	
	MEN	WOMEN
<b>Lockers</b>	16	8
<b>Toilets</b>	3	3
<b>Urinals</b>	2	-
<b>Lavatories</b>	3	3
<b>Unisex Showers</b>	2	

2-7.13.1 **Women's Locker Room.** Provide one room sized to accommodate the number of lockers and plumbing fixtures described. Provide exterior entrance(s) with vestibule. For egress purposes, the occupant load shall be equal to the higher of the following numbers: a) the number of lockers in the room, or b) the code determined number of occupants calculated by multiplying room area x the occupant load factor.

2-7.13.1.1 Function: Toilets, showers and lockers for female soldiers.

2-7.13.1.2 **Furnishings/Fixtures/Equipment (FFE):** The following items will be Contractor furnished and installed: floor mounted toilets, wall-hung lavatories, and ceramic tile shower enclosures in the quantities indicated in the table above. Provide toilet partitions at each toilet. Provide the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one sanitary napkin disposal per toilet; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet; one soap holder per shower; one shower curtain and rod at each shower; two double pin robe hooks at each dressing compartment; one robe hook on each toilet partition door; one sanitary napkin and tampon vending machine. Provide 305 mm [1'-0"] of locker room bench per 5 lockers provided. Provide two wall mounted GFCI electric outlets per two lavatories (or fraction thereof); mount adjacent to mirrors. Provide electric water cooler (EWC) at entrance vestibule from exterior. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-7.13.1.3 **Finishes:**

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile.

Ceiling: painted water resistant gypsum board.

2-7.13.1.4 Other requirements: Provide 914 mm [3'-0"] wide entry door. Locks shall be as specified in paragraph 5-4.9.5.3.

2-7.13.2 **Men's Locker Room.** Provide one room, sized to accommodate the number of lockers and plumbing fixtures described. Provide exterior entrance(s) with airlock vestibule. For egress purposes, the occupant load shall be equal to the higher of the following numbers: a) the number of lockers in the room, or

b) the code determined number of occupants calculated by multiplying room area x the occupant load factor.

2-7.13.2.1 Function: Toilets, showers and lockers for male soldiers.

2-7.13.2.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets, wall-hung lavatories, and ceramic tile shower enclosures in the quantities indicated in the table above. Provide toilet partitions at each toilet. Provide the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one sanitary napkin disposal per toilet; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet; one soap holder per shower; one shower curtain and rod at each shower; two double pin robe hooks at each dressing compartment; one robe hook on each toilet partition door; one sanitary napkin and tampon vending machine. Provide 305 mm [1'-0"] of locker room bench per 5 lockers provided. Provide two wall mounted GFCI electric outlets per two lavatories (or fraction thereof); mount adjacent to mirrors. Provide electric water cooler (EWC) at entrance vestibule from exterior. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-7.13.2.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile.

Ceiling: painted water resistant gypsum board.

2-7.13.2.4 Other requirements: Provide 914 mm [3'-0"] wide entry door. Locks shall be as specified in paragraph 5-4.9.5.3.

2-7.13.3 **Janitor Closet (JAN).** Provide two on the third floor. Room shall be accessed from COF Toilet/Shower.

2-7.13.3.1 Function: Service sink and storage of cleaning supplies, soap, and paper products.

2-7.13.3.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: one floor mounted mop sink, mop rack for three mops, and minimum 1524 linear mm of wall mounted stainless steel shelving.

2-7.13.3.3 Finishes:

Floor: vinyl composition tile

Base: resilient cove base

Walls: painted water-resistant gypsum wallboard.

Ceiling: painted gypsum wallboard

2-7.14 **BUILDING 357 SUPPORT AREAS.** Provide the following areas for the Battalion HQ building. Handicapped accessibility is not required in mechanical rooms, electrical and communications closets, and elevator machine room. All other support spaces shall be handicap accessible.

2-7.14.1 **Mechanical Room(s) (MECH).** Provide dedicated areas for mechanical equipment located on the third floor. Each battalion shall have independent operation and control of HVAC system for its own spaces, but mechanical equipment may serve more than one battalion, and mechanical rooms may be combined. Mechanical rooms shall not be used for storage or other purposes. Access will be limited to authorized personnel. Rooms shall allow easy equipment removal and maintenance. Provide floor openings and vertical shaft spaces as necessary.

2-7.14.1.1 Function: Spaces for HVAC, water heating, and other plumbing and mechanical equipment.

2-7.14.1.2 Furnishings/Fixtures/Equipment: None.

2-7.14.1.3 Finishes:

Floor: sealed concrete

Base: resilient cove base

Walls: painted gypsum wallboard and painted concrete masonry units

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-7.14.1.4 Other requirements: Doors shall have storeroom function lockset master-keyed to existing system.

2-7.14.2 **Electrical Room(s) (ELEC).** Provide dedicated areas for electrical equipment located on the third floor. Each battalion shall have independent metering and control of the electrical system for its own spaces, but electrical equipment may serve more than one battalion, and electrical rooms may be combined. Electrical rooms shall not be used for storage or other purposes. Access will be limited to authorized personnel. Rooms shall allow easy equipment removal and maintenance.

2-7.14.2.1 Function: Spaces for electrical equipment.

2-7.14.2.2 Furnishings/Fixtures/Equipment: None.

2-7.14.2.3 Finishes: Floor: sealed concrete

Base: resilient cove base

Walls: painted gypsum wallboard or painted veneer plaster, or painted concrete masonry units

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-7.14.2.4 Other requirements: Electrical service to buildings shall be underground. Doors shall have storeroom function lockset master-keyed to existing system..

2-7.14.3 **Telecommunication Room (TELE).** Provide dedicated room(s) for communication distribution equipment located on the third floor. Each room shall be dedicated to a single battalion, and shall not be combined with mechanical or electrical rooms. Provide each battalion with one main communication room; minimum size 3048 mm [10'-0"] x 3353 mm [11'-0"]. In two-story buildings, the communication room shall be located on the second floor. Provide additional communication rooms as needed; all spaces having telephone or computer data outlets shall be located to allow a maximum cable length of 90 m [295 feet] between outlet and communication room. Minimum dimensions of secondary communication rooms shall be 2134 mm [7'-0"] x 3048 mm [10'-0"]. Provide floor openings and vertical shaft spaces as necessary. Rooms shall be accessed from corridors. Access will be limited to authorized personnel.

2-7.14.3.1 Function: Distribution areas for telephone, data network, and cable television.

2-7.14.3.2 Furnishings/Fixtures/Equipment: None.

2-7.14.3.3 Finishes: Floor: vinyl composition tile.

Base: resilient cove base

Walls: painted gypsum wallboard, or painted concrete masonry units

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-7.14.3.4 Other requirements: Door shall have minimum 914 mm [3'-0"] wide door with lockset master-keyed to existing system.. Provide three 102 mm [4"] empty conduits connecting vertically stacked communication rooms.

2-7.14.4 **Elevator.** Provide one hydraulic passenger elevator.

2-7.14.4.1 Function: Vertical conveyance of people and furniture.

2-7.14.4.2 Furnishings/Fixtures/Equipment: Passenger elevator: 2,500 lb. capacity, minimum 75 feet per minute speed; center opening doors. Refer to Chapter 5 for additional requirements.

2-7.14.4.3 Cab finishes: Floor: vinyl composition tile  
Walls: plastic laminate  
Ceiling: suspended translucent panel  
Car door and front: satin finish stainless steel  
Hoistway entrance doors and frame: satin finish stainless steel

2-7.14.4.4 Other requirements: Handicapped accessible.

2-7.14.5 **Elevator Machine Room (MACH).** Provide one on the first floor. Size to comply with equipment and code requirements.

2-7.14.5.1 Function: Space for hydraulic elevator equipment.

2-7.14.5.2 Furnishings/Fixtures/Equipment: None.

2-7.14.5.3 Finishes: Floor: sealed concrete  
Base: resilient cove base  
Walls: painted concrete, or painted concrete masonry units  
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-7.14.6 **Interior Corridor.** Provide as required to allow circulation to building spaces, and comply with applicable code egress requirements. Due to security, climate, and force protection concerns, interior corridors are the preferred means of circulation between living units and other building spaces.

2-7.14.6.1 Function: Circulation and means of egress.

2-7.14.6.2 Furnishings/Fixtures/Equipment (FFE): Provide mechanical and electrical systems to comply with applicable codes. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-7.14.6.3 Finishes:  
Floor: vinyl composition tile  
Base: resilient cove base.  
Walls: impact resistant gypsum wallboard with painted finish.  
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-7.14.6.4 Other requirements: Handicap accessible.

2-7.14.7 **Exterior Corridor (LANAI).** Refers to an unconditioned, covered circulation space that is enclosed on one long side (adjacent to the building), and has a guardrail on the other side. Provide as required to allow circulation to building spaces and comply with applicable code egress requirements. exterior corridors may be provided to link breezeways with stairs and other circulation components. Exterior corridors shall not be used to provide access to living units

2-7.14.7.1 Function: Circulation and means of egress.

2-7.14.7.2 Furnishings/Fixtures/Equipment (FFE): Provide mechanical and electrical systems to comply with applicable codes. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with

applicable codes. All fixtures and equipment shall be suitable for exterior locations.

#### 2-7.14.7.3 Finishes:

Floor: sealed concrete

Base: Exterior wall material

Walls: Exterior wall material

Ceiling: painted underside of concrete structure above

2-7.14.7.4 Other requirements: Handicap accessible. With the exception of fire sprinkler systems, no piping, conduit or ductwork shall be exposed in exterior corridor. Provide slip resistant finish texture on concrete floor. Guardrails shall be designed in accordance with applicable codes.

#### 2-7.14.8 **Loft Space (LOFT).** Occurs on the third floor of Building 357

2-7.14.8.1 Function: unfinished space

2-7.14.8.2 Furnishings/Fixtures/Equipment: N.A.

#### 2-7.14.8.3 Finishes:

Floor: stripped smooth of existing finish

Base: none

Walls: paint existing walls

Ceiling: painted underside of concrete structure above.

2-7.14.8.4 Other requirements: Provide pair of 914 mm [3'-0"] wide historic doors as required.

**2-7.15 Common Locker/Shower Facilities Building 357 (COF TOILET/SHOWER).** Provide one group of men's and one group of women's common locker/shower facilities for each company. Three (3) COF Toilet/Shower shall be provided, one on each floor, in Building 355. Two (2) COF Toilet/Shower shall be provided on the second floor in Building 357. The COF Toilet/Shower for the Large COF shall be located on the third floor of Building 355.. Quantities of lockers and plumbing fixtures for men and women vary by company size. Provide the quantity of lockers and fixtures for Medium Company Operations Facility on the first and second floor and as indicated in the table below. Provide the quantity of lockers and fixtures for Large Company Operations Facility on the third floor and as indicated in the table below. Soldiers will use locker rooms before and after physical training. Handicapped accessibility is not required. Additional entrances may be provided from a common public corridor in the COF. Entrances shall be separate and distinct from the entrances to company supply and administrative areas. Exterior entrance vestibules shall be provided. Entrances shall provide visual privacy into the spaces.

**Table 2-7.15 Locker Room Plumbing Fixture and Locker Quantities**

	MEDIUM COMPANY	
	MEN	WOMEN
<b>Lockers</b>	82	8
<b>Toilets</b>	2	1
<b>Urinals</b>	1	-
<b>Lavatories</b>	2	1
<b>Showers *</b>	5	1

2-7.15.1 **Women's Locker Room.** Provide one or more rooms, sized to accommodate the number of lockers and plumbing fixtures required for each company served. Provide exterior entrance(s) with vestibule. For egress purposes, the occupant load shall be equal to the higher of the following numbers: a) the number of lockers in the room, or b) the code determined number of occupants calculated by multiplying

room area x the occupant load factor.

2-7.15.1.1 Function: Toilets, showers and lockers for female soldiers.

2-7.15.1.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets, wall-hung lavatories, and ceramic tile shower enclosures in the quantities indicated in the table above. Provide toilet partitions at each toilet. Provide the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one sanitary napkin disposal per toilet; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet; one soap holder per shower; one shower curtain and rod at each shower; two double pin robe hooks at each dressing compartment; one robe hook on each toilet partition door; one sanitary napkin and tampon vending machine. Provide 305 mm [1'-0"] of locker room bench per 5 lockers provided. Provide two wall mounted GFCI electric outlets per two lavatories (or fraction thereof); mount adjacent to mirrors. Provide electric water cooler (EWC) at entrance vestibule from exterior. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-7.15.1.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile.

Ceiling: painted water resistant gypsum board.

2-7.15.1.4 Other requirements: Provide 914 mm [3'-0"] wide entry door. Locks shall be as specified in paragraph 5-4.9.5.3.

2-7.15.2 **Men's Locker Room.** Provide one or more rooms, sized to accommodate the number of lockers and plumbing fixtures required for each company served. Provide exterior entrance(s) with vestibule. For egress purposes, the occupant load shall be equal to the higher of the following numbers: a) the number of lockers in the room, or b) the code determined number of occupants calculated by multiplying room area x the occupant load factor.

2-7.15.2.1 Function: Toilets, showers and lockers for male soldiers.

2-7.15.2.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets, wall-hung lavatories, and ceramic tile shower enclosures in the quantities indicated in the table above. Provide toilet partitions at each toilet. Provide the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet; one soap holder per shower; one shower curtain and rod at each shower; one double pin robe hook outside each shower; one robe hook on each toilet partition door. Provide 305 mm [1'-0"] of locker room bench per 5 lockers provided. Provide two wall mounted GFCI electric outlets per two lavatories (or fraction thereof); mount adjacent to mirrors. Provide electric water cooler (EWC) at entrance vestibule from exterior. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-7.15.2.3 Finishes:

Floor: ceramic tile.

Base: ceramic tile.

Walls: ceramic tile.

Ceiling: painted water resistant gypsum board.

2-7.15.2.4 Other requirements: Provide 914 mm [3'-0"] wide entry door. Locks shall be as specified in paragraph 5-4.9.5.3.

**2-8 OTHER STRUCTURES.** Detached Structures that support the four Quad Buildings

**2-8.1 Gear Wash Building (GEAR WASH BUILDING).** Provide one located at the courtyard of Quad C. This structure is a combination of Gear wash and recreation area. Provide covered and paved exterior structure for gear wash and picnic functions. The recreation and gear wash area will be used by several soldiers at a time. Design similar to Quad F Gear Wash Building, see sketches in Attachment 25

**2-8.1.1** Function: Exterior area for washing, TA-50 gear and footgear prior to entering building. Also, area for outdoor recreation that includes picnic table and barbeque area.

**2-8.1.2** Furnishings/Fixtures/Equipment: the following items will be Contractor furnished and installed: Provide drainage assembly for gear wash area: provide continuous x 305 mm [12"] wide aluminum or stainless steel trench grating, with non-slip surface, supported by concrete trench walls. Concrete trench will terminate at a storm drainage inlet box. Box shall be filled with stone and filter material to trap sediment. Filtered runoff shall be piped to storm drainage system. Provide hosebib at 914mm [3'-0"] on center and 914mm [3'-0"] above floor grating. Provide main shut-off valve for hosebibs. Provide stainless steel gear rack for mounting on wall above trench grating; gear rack properties: 13mm [1/2"] thick x 152mm [6"] high x continuous length of trench drain. Fabricate in 1676mm [5'-6"] sections. Gear rack shall be mounted at 1676 mm [5'-6"] above trench. Top of grating and concrete structure shall align with adjacent concrete sidewalk. Provide concrete sidewalk between boot wash area and entrance sidewalk. Provide S.S. one basin wall mounted hand sink. Provide. The following items will Government furnished and installed: picnic tables and single chairs for 60 people.

**2-8.1.3** Finishes: refer to exterior building material requirements.

**2-8.1.4** Other requirements: Provide adequate drainage away from building.

**2-8.2 Pump House (PUMP HOUSE).** Provide one at the corner of Waianae and Meigs Avenue.

**2-8.2.1** Function: Exterior self-supporting building for fire pump equipment including, but not limited to, equipment as indicated.

**2-8.2.2** Furnishings/Fixtures/Equipment: As required by Statement of Work and as indicated. Concrete floor slab shall be of sufficient strength and be designed for the equipment provided.

**2-8.2.3** Finishes: refer to exterior building material requirements, see Chapter 5, paragraph 5-4.

Floor: sealed concrete; non-slip coating.

Base: none

Walls: painted concrete masonry units

Ceiling: exposed to structure, paint.

**2-8.2.4** Other requirements: Provide adequate drainage away from building.

**2-8.3 Chiller Plant Building (CHILLER PLANT BUILDING).** Provide one at the corner of Waianae and Meigs Avenue.

**2-8.3.1** Function: Exterior self-supporting building for HVAC and hot water equipment including, but not limited to, equipment as indicated and in the Statement of Work

**2-8.3.2** Furnishings/Fixtures/Equipment: As required by Statement of Work and as indicated. Concrete floor slab shall be of sufficient strength and be designed for the equipment provided.

**2-8.3.3** Finishes: refer to exterior building material requirements, see Chapter 5, paragraph 5-4.

Floor: sealed concrete; non-slip coating.

Base: none

Walls: painted concrete masonry units

Ceiling: exposed to structure, paint.

2-8.3.4 Other requirements: Provide adequate drainage away from building.



## CHAPTER 3

### SITE PLANNING AND DESIGN

3-1 **SCOPE OF WORK.** This project consists of renovation and improvement of an existing Brigade Complex. Site planning and design shall be based on the concept design provided with the RFP drawings and the SOW requirements contained herein.

3-2 **SITE VERIFICATION.** Graphic and narrative descriptions of site opportunities and constraints have been provided. Concept design (approximately 30-35% level) Demolition, Site and Utility and Grading Plans are included with the RFP drawings. Water and electrical utility base maps are also included for informational purposes. Each offeror shall verify that the site meets the program requirements. The offeror shall perform a detailed site analysis to verify that the site meets the Brigade Complex requirements that are provided. The analysis results shall be documented in a written and graphic summary of site opportunities and constraints.

3-3 **EXISTING CONDITIONS.** The offeror shall be provided with a digital topographic survey for this site by the Contracting Office. It is the offeror's responsibility to verify the Government-furnished survey and obtain all additional survey information that may be required for a completed design and construction project. Any discrepancies which are found in the Government furnished survey shall be brought to the immediate attention of the Contracting Officer for clarification.

Schofield Barracks Brigade Complex, Quad C is bound by Waianae Avenue and Foote Avenue to the north and south, and Meigs Avenue and Flagler Avenue to the east and west. The complex encompasses approximately 4 hectare, in which Buildings 355, 356, 357 and 358 are situated. Existing uses within the complex include billeting, storage, administrative operations, and dining facilities for military personnel. An access road and parking are currently provided within the Quad as well as at the perimeter. A large open courtyard and basketball courts lie within the center of the Quad.

Potable water, wastewater, fire protection and a drainage system provide support to the on-site facilities. However, preliminary analyses of the supporting infrastructure indicate that the existing utilities are deteriorating and inadequate in providing sufficient service to the complex.

3-3.1 **BaseMaps.** Maps of the existing water and electrical distribution systems are included in the RFP drawings. The locations of existing utilities shown on the utility maps are approximate only. The offeror shall scan the construction site with electromagnetic or sonic equipment and mark the surface of the ground where existing underground utilities are discovered. Immediately contact the Contracting Officer if actual conditions vary from the topographic survey.

3-4 **EXCAVATION PERMITS.** The contractor shall obtain approved U.S. Army Garrison, Hawaii Excavation Permit prior to beginning excavation work. A copy of the USAGH Excavation Permit is attached.

3-5 **SITE DEVELOPMENT PLAN.** Site improvements for the Quad C renovation should include:

- Provide grading for disturbed areas as a result of demolition work. Grade for parking lot extension east of Building 358. Additional parking provided shall replace those stalls lost as a result of AT/FP standoff requirements. Review existing site grading and correct any existing drainage deficiencies that may occur.
- Install new concrete curbs/ gutters within Quad C project limits.
- Install new concrete walkways within Quad C project limits.
- Install new AC pavement at interior access road within the Quad. Pavement analysis shall be conducted to verify pavement design.
- Extend parking lot east of Building 358 to provide for additional parking stalls removed for AT/FP requirements. Restripe the existing parking lot, as required to provide the required

standoff distance.

- Install “No Parking” signage along Foote Avenue, Flagler Road, and Waianae Avenue.
- Parking with controlled access will be provided within Quad C for organizational vehicles only. Provide new pavement striping, as required.
- Cold-plane and provide 32 mm AC pavement overlay and acrylic surface at existing basketball courts. Provide restriping for two basketball courts and two volleyball courts.
- Install new posts and goals for each basketball court. Provisions for volleyball courts shall also be made.
- Install traffic gate (key card) for AT/FP access and exit control within Quad C. Access locations should be located along Waianae Avenue and intersection of Foote Avenue and Flagler Road. Exit locations should be provided at Foote Avenue and intersection of Waianae Avenue and Flagler Road.
- Install traffic gate (key card) and curbed landscape planters for AT/FP access control to parking lot east of Building 358.
- Install pipe bollards adjacent to new elevator shaft at Building 355.
- Provide two new bike racks (13 each, minimum) with concrete slabs adjacent to Buildings 355 and 356.
- Locate covered gear wash adjacent to basketball courts. Effluent shall be discharged into the sewer system.
- Locate chiller plant and fire pump house at area east of Building 355.
- Locate trash container enclosure at parking lot east of Building 358. Trash enclosure should be located outside the 25 meter standoff area.
- Contractor’s operations and storage area shall be located as shown in attachment 31.

3-6 **GRADING AND DRAINAGE.** The drainage scheme shall consist of all surface runoff directed to existing curb inlets adjacent to the project site. In addition, the grading should provide grading for areas disturbed during demolition and construction.

The principles of positive drainage should be applied to control the conditions that remove rainfall away from facilities and functions. Federal, State and local regulations regarding the design of stormwater management systems shall be considered the minimum design criteria. An NPDES permit shall be obtained as necessary. Additionally, minimize the impact of construction activities on drainage and prevent loss of soils by water and wind erosion. Designs which improve on existing water quality by incorporating sustainable design principles are encouraged, consistent with budget constraints and activity requirements.

3-7 **GENERAL SITE DESIGN CRITERIA.** Site design criteria shall be based on the concept design provided or as approved. The concept design established the following: orientation, site organization, spatial balance, character and scale, compatibility, life safety, circulation systems, view of the site, buffer zones, wind control, vehicular and pedestrian access, parking spaces for residents, administrative staff, handicapped, and visitors, connecting walks, fire protection access, site lighting, site furnishings, mechanical enclosures, trash collection dumpsters with trash enclosures, landscaping, and etc. Perimeters are restricted by antiterrorism/force protection minimum stand off distances.

3-8 **CIRCULATION AND PARKING.** The vehicular and pedestrian circulation system shall be based on the concept design provided or as approved. Quad C can be accessed from Waianae Avenue, Foote Avenue and Flagler Avenue by both vehicles and pedestrians. An access road, which shall be replaced, is

provided within the Quad, which provides vehicular circulation for military personnel within the complex. Existing pipe posts and chains provide controlled access into the Quad, however, they are old and need to be replaced. Concrete walkways provide for pedestrian circulation through the site. Due to the condition of the existing walkways, curbs and gutters, which are mildew stained, broken and uneven (tripping hazard), all walkways, curbs and gutters within the Quad should be replaced.

Additional parking stalls will be provided, to replace stalls removed for AT/FP requirements, by extending the parking east of building 358. Parking with controlled access, keyed gates and barriers for AF/TP access control, will be provided, within Quad C, for organizational vehicles only and for the POV parking lots west of building 356 and east of building 358. The circulation and parking system shall promote safe, efficient movement of vehicles and pedestrians within the site area. The vehicular and pedestrian circulation system should maintain the maximum separation of vehicles and pedestrians. Safe circulation systems have a clear hierarchy of movement, lead to a clear destination, and do not interrupt other functions. The following criteria shall be considered for designing parking and drives for vehicles and pedestrians:

**3-8.1 Vehicular Circulation.** Vehicular circulation layout is determined by applying the design vehicle templates to the site design. The passenger car class includes passenger cars and light delivery trucks, such as vans and pick-ups. The passenger car template is equivalent to the non-organizational - privately owned vehicle (POV). The truck class template includes single-unit trucks, recreation vehicles, buses, truck tractor semi-trailer combinations, and trucks or truck tractors with semi-trailers in combination with full trailers. Templates showing the turning movements for design vehicles are provided by the American Association of State Highway and Transportation Officials (AASHTO). Obtain templates and utilize them during the design of the facility. Provide the vehicle clearances that are required to meet traffic safety for emergency vehicles, service vehicles, and moving vans. Site entrances and site drive aisles shall include required traffic control signage. Maximize spacing between drives, incorporate right-angle turns, and limit the points of conflicts between traffic. Roadways shall be striped and marked with with thermoplastic compounds.

**3-8.2 Parking and Access Driveway Design.** Design all pavements for the wheel load associated with the design vehicle. Driveways shall be designed for two-way traffic and with a 3.1 m [10 ft.] minimum lane width. Minimum pavement edge radius for driveway intersection with installation roads shall be 4.6 m [15 ft.] and 9 m [30 ft.] respectfully.

**3-8.3 Parking Area Layout Design.**

**3-8.3.1 Administrative Parking Area.** Provide 44 parking stalls for area west of building 356 and 148 stalls for the area east of building 358. POV stalls without vehicle overhang shall be a 2.7 m x 5.5 m [9 ft x 18 ft]. The design vehicle template that is used to design this space shall be described. Parking aisle width shall be minimum 7.5m (24 ft.). Island widths shall be minimum 3 m (9 ft). Parking stall fillets shall be minimum 1 m (3 ft).

**3-8.3.2 Handicap Accessible Vehicle (HAV) Parking.** Parking space width, length, pavement marking, signage and accessible route clearances shall be provided as required to meet current Federal Accessibility Standards (FAS) and Americans with Disabilities Act Accessibility Guidelines (ADAAG)..

**3-8.3.3 Wheel Stops.** Vehicle wheel stops shall be provided. Wheel stops shall be positioned to prevent vehicle overhang from encroaching and damaging adjacent objects (sign post, planter box, etc.) located immediately in front of the stall.

**3-8.3.3 Pavement Marking.** Parking stall markings for other than handicap accessible stalls shall be painted with white 4-inch wide stripes. Arrows shall be marked with thermoplastic compounds. Parking spaces shall be marked reserved for military staff, organizational, employee, visitor, etc. After award, Contractor shall coordinate with the Government for exact number of reserved stalls and labeling requirements. Stop or approved bar stripes shall be provided at intersections at stop conditions with white thermoplastic striping.

3-8.4 Pedestrian Circulation. Pedestrian paths shall be provided from the parking areas to the building and from the existing roadway to the building. Pedestrian circulation should be safe and separate from vehicle circulation. Provide good sidewalk layout to connect all building entrances with parking and site facilities and existing walks. Pedestrian circulation should be based on pedestrian desired lines of walking between site facilities and existing walks. Desired lines should be weighted to predict the most traveled routes. These routes would require paving. Topography and vegetation can be used to reinforce a sense of movement. Design pedestrian concentration areas with adequate paved area.

3-8.4.1 Sidewalk Design. Sidewalk design shall be based on the concept design provided. Walks widths shall be as indicated on the concept design drawings. Sidewalks shall be constructed with wire mesh reinforced concrete with a minimum thickness of 100 mm [4 in] and 1.25m(4 ft.) wide.

3-8.4.2 Ramps. Where required, ramps for the handicapped shall meet Federal Accessibility Standards (FAS) and Americans with Disabilities Act Accessibility Guidelines (ADAAG).

3-8.5 Trash and Electrical Equipment Enclosure Design.

3-8.5.1 General. Approximate size and layout of Trash and Electrical enclosures are indicated on the attached RFP civil concept drawings. Mechanical enclosure is attached to the southeast corner of the building and is indicated on the Architectural RFP Drawings. Contractor shall ensure final layout design will satisfy operational and maintenance requirements.

3-8.5.2 Trash Enclosure. Trash enclosure size and layout shall be compatible with the type of trash bin and collection service requirements. Design-Build Contractor shall coordinate with the DPW contracting office, 808-969-2496, for operational requirements. Enclosure wall height shall be sufficient to screen views from adjacent buildings and public roadways. Walls shall be constructed of split face CMU and shall be compatible with the architectural theme of the proposed new facility. In addition, trash enclosures shall be provided with a wheel stop along base of the far/inside wall of the enclosure to function as a barrier to protect the enclosure wall from accidental impacts.

3-8.5.3 Electrical Equipment Enclosure. Size of enclosure shall be in compliance with applicable codes and equipment manufacturer requirements. For applicable codes sheet Chapter 4, Site Engineering, Para. Section, Electrical Distribution.

### 3-9 ANTITERRORISM/FORCE PROTECTION (AT/FP) STANDOFF REQUIREMENTS.

3-9.1. General. The facilities shall be designed to meet DOD AT/FP requirements. (Note: For AT/FP Structural Requirements, see Chapter 6, Structural Design.)

3-9.2. Project Specific Requirements. Site Force Protection Standards that apply to the Quad C renovation project are as follows (Refer to structural engineering design analysis as it pertains to standoff requirements):

- Facility Characteristics (Unobstructed Space): Ensure that obstructions within 10 meters of inhabited buildings or portions thereof do not allow for concealment from observation of explosive devices 150 mm or greater in height.
- Establish access control to portions of parking areas that are closer than the required standoff distance to ensure unauthorized vehicles are not allowed closer than the required standoff distance. For primary gathering buildings and billeting, if access control is provided within the standoff distance, controlled parking may be permitted as close as 10 meters without hardening or analysis.
- Eliminate parking on roadways within the required standoff distances along roads adjacent to existing buildings.

For trash containers the minimum standoff distances apply:

- Inhabited Buildings – 10 meters
- Where the standoff distance is not available, harden trash enclosures to mitigate the direct blast effects and secondary fragment effects of the explosive on the building if the applicable level of protection can be proven by analysis. If trash enclosures are secured to preclude introduction of objects into the enclosures by unauthorized personnel, they may be located closer to the building as long as the provisions for “unobstructed space” are not violated.
- Openings in screening materials and gaps between the ground and screens or walls making up an enclosure must not be greater than 150 mm.

3-10 **REFERENCE REQUIREMENTS AND STANDARDS.** (Note: Where a conflict between requirements and/or standards occur, the more stringent shall apply.)

3-10.1. **Army/Military Construction Criteria.** Unless otherwise noted, the following criteria is available via the internet at;

<http://www.hnd.usace.army.mil/techinfo/engpubs.htm>

3-10.1.1. U.S. Army Corps of Engineers Technical Instructions, TI 800-01, Design Criteria, 20 July 1998.

3-10.1.2. U.S. Army Corps of Engineers Technical Instructions, TI 804-21, Design for Non-Organizational or Privately Owned Vehicle (POV), Site Circulation and Parking, November 1998.

3-10.1.3. Engineers Technical U.S. Army Corps of Instructions, TI 814-20, Wastewater Collection, 3 August 1998

3-10.1.4. Army Technical Manual, TM 5-813-5, Water Supply, Water Distribution, November 1986

3-10.1.5. United Facilities Criteria, UFC 3-600-01, Design: Fire Protection Engineering for Facilities, 17 April 2003.

3-10.1.6 Interim Department of Defense Antiterrorism/Force Protection Construction Standards, December 16, 1999. (For Official Use Only, not available for viewing or download. After award of the Contract, a copy will be provided to the Contractor.)

3-10.1.7 Unified Facilities Guide Specifications (UFGS). The web site address is <http://www.hnd.usace.army.mil/techinfo/gspec.htm>

3-10.1.8 US Army Corps of Engineers Technical Instructions, TI 810-32, Heating and Cooling Distribution Systems, 10 January 2003.

3-10.1.9 UFC 4-010-01, DoD Minimum Antiterrorism standards for Buildings, 31 July 2002.

3-10.2. City and County of Honolulu Design Standards. The following references are available for purchase from the City and County of Honolulu Municipal Book Store, 558 South King Street, City Hall Annex, Honolulu, HI 96813, Phone: (808) 523-4780. Information on how to purchase and order publications is available via the internet at;

<http://www.co.honolulu.hi.us/pur/booklist.htm>

3-10.2.1. Rules Relating to Storm Drainage Standards, Department of Planning and Permitting, City & County of Honolulu, January 2000.

3-10.2.2. The Department of Public Works, Standard Specifications for Public Works Construction, City and

County of Honolulu, Sept. 1986.

3-10.2.3. The Department of Public Works, Standard Details for Public Works Construction, City and County of Honolulu, Sept 1984.

3-10.2.4. Board of Water Supply, Water System Standard and Approved Material List and Standard Details for Water System Construction, Volume 1 and 2, City and County of Honolulu, 2002.

3-10.3 American Association of State Highway and Transportation Officials (ASSHTO) Publications. Standards are available online at [www.transportation.org](http://www.transportation.org)

3-10.3.1 U.S. Department of Transportation, Federal Highways Administration, Manual On Uniform Traffic Control Devices, Millennium Edition

3-10.3.2 AASHTO LRFD Bridge Design Specifications, 2nd Edition, 1998.

3-10.3.3 ASSHTO A Policy on Geometric Design of Highways and Streets, 4<sup>th</sup> Edition - The Green Book, 2001.

3-10.3.4 ASSHTO Roadside Design Guide, 2002.

3-10.3.5 UFC 4-010-01

3-10.4. Americans with Disabilities Act Accessibility Guidelines (ADAAG). Available from U.S. Architectural and Transportation Barriers Compliance Board, Suite 1000, 1331 F Street, N.W., Washington, D.C. 20004-2111 (202) 272-5434 or through the internet (<http://www.access-board.gov/indexes/accessindex.htm>).

3-10.5. American Water Works Association, Inc. (AWWA). Specifications are available from AWWA, 6666 Quincy Ave., Denver, CO 80235; voice: 800-926-7337; fax: 303-795-1989; <http://www.awwa.org/>. AWWA standards called for the standards of the Board of Water Supply, City and County of Honolulu, the following apply: AWWA C907 PolyVinyl Chloride (PVC) Pressure Fittings for Water - 4 Inch Through 8 Inch (100 mm Through 200 mm).

3-10.6 Storm Drainage Standards, Department of Public Works, County of Hawaii, February 1970. Information: Phone: 961-8321, Address: Hawaii County Building, 25 Aupuni Street, Room 202, Hilo, HI 96720.

### 3-11 **SOILS, PAVEMENTS AND EARTHWORK**

Soils Investigation Report (Geotechnical Report). Preliminary Soils Investigation Report dated March 2003 for Quad C is furnished in attachment entitled Preliminary Soils Investigation Report. Based upon the data provided in the RFP and Preliminary Soils Investigation Letter Report, a comprehensive Final Soils Investigation Report shall be furnished by the Offeror to whom this contract is awarded. The Final Soils Investigation Report shall be prepared by a professional engineer registered in the State of Hawaii with more than 10 years of experience in soil mechanics and geotechnical engineering. The Final Soils Investigation Report shall certify to the adequacy of the soil and foundation aspects of the design, including, but not limited to, special foundation types, earthwork construction, surface and subsurface drainage, erosion and siltation prevention during and after construction, and settlement or heave. After Government review of the Final Soils Investigation Report, additional soil borings, testing, and investigation, if required, shall be furnished by the Offeror with the final design documents at no additional cost to the Government.

NOTE TO OFFEROR: The soils investigation report furnished by the Government is a Preliminary Report intended for basic information only. The approximate subsurface soil conditions may not represent conditions at all locations. The flexible pavement sections and overlays shall be as designed for actual traffic and soil

conditions, but in no case shall they be lighter (thinner) than that indicated below and in the Preliminary Soils Investigation Letter Report. Should new traffic parameters or actual soil conditions require a heavier pavement structure, a thicker pavement section shall be furnished by the Offeror.

### 3-11.1. Minimum Pavement Structures:

Parking Lots: 50 mm (2") Asphaltic Concrete, State DOT IV Mix, 150 mm (6")  
Base Course, 125 mm (5") Subbase Course

Subbase and Base Course Compaction: Subbase and base course shall be compacted to minimum 100% of maximum density in accordance with AASHTO T 180.

### 3-11.2. Soil Compaction.

3-11.2.1. Soil compaction shall be per local standards specified for use in this contract and as amended herein. Compact each layer to not less than the percentage of maximum density specified in Table 3.1, determined in accordance with ASTM D 1557 Method D:

**TABLE 3.1- SOIL COMPACTION**

Subgrade Preparation, Fills, Embankments, and Backfills	Compaction Requirements (Percentage of Maximum Density)	
Structures & Building Slabs	Cohesive Material	Cohesionless Materials
	90	95
Streets, Paved Areas, Bike Paths	90	95
Sidewalks and Grassed Areas	85	90

3-11.2.2. The compaction requirements shall be verified or modifications shall be recommended by the soils engineer in the Final Soils Report wherever engineering, soils, or climatic factors indicate the necessity to do so. Any modification to the stated compaction requirements shall require the approval of the Contracting Officer.

### 3-11.2.3. Soil Classification.

3-11.2.3.1. Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW and SP. Cohesive materials include materials classified as GC, SC, ML, CL, and MH. Materials classified as GM and SM shall be identified as cohesionless only when the fines are nonplastic.

3-11.2.3.2. Satisfactory materials for filling and backfilling under all structures and general earthwork shall comprise any excavated on-site materials or imported materials classified in accordance with ASTM D 2487 as GW, GM, GC, GP, SW, SP, SM, SC, ML, MH, and CL, free of organic matter, stones larger than 75 mm (3-inches) in any dimension, other deleterious materials, and expansive values less than or equal to 2% when tested by the California Bearing Ratio method. For imported materials, that portion passing the No. 40 sieve shall be either nonplastic or shall have a liquid limit not greater than 40 and a plasticity index not greater than 15. Liquid limit and plasticity index shall be determined by ASTM D 4318. Where satisfactory materials are not available in sufficient quantity from required excavations, borrow materials shall be obtained from approved sources off Government-control land at the Contractor's responsibility.

**3-11.3. Concrete Slab-On-Grade.**

3-11.3.1. Granular Termite Barrier (GTB), see sketches in attachment section for typical sections: A 100 mm (4-inch) minimum thickness granular termite barrier shall be installed under the concrete slab of the building. The GTB shall be placed under the vapor barrier and over the capillary water barrier (CWB) with a separation geotextile installed between the GTB and the CWB.

3-11.3.1.1. Exterior Perimeter Footings: When "stayform" is used to retain a vertical face along the inside of exterior footings, the bottom of the stayform shall be elevated 50 mm (2 inches) above the bottom of the footing to allow GTB material to migrate beneath the bottom of the stayform and separate the stayform and the subgrade. Along the outside edge of the footing, a minimum 100 mm (4-inch) wide, vertical GTB-filled-trench shall be provided. A root control fabric impregnated with plastic nodules containing trifluralin, Bio-barrier Root Control, or equal, shall be installed along the vertical interface between the GTB and the adjacent soil. The root control fabric shall provide continuous and effective root control for 15 years or longer. A cast-in-place concrete strip, 300 mm (12-inch) wide by 75 mm (3-inch) thick, with 5% transverse slope, shall be provided at the ground surface to cap the GTB strip. The concrete strip shall be reinforced with 6/6 X W2.0 X W2.0 WWF. Contraction joints shall be provided at maximum 4'-0" spacing.

3-11.3.1.2. The natural angle of repose of the GTB material is about 10H:3V when dry and 10H:3.75V when wet. Accordingly, GTB on sloping surfaces shall be placed at slopes no steeper than 3H:1V. This will require that the sloping faces of thickened-edge footings, including the under-side concrete fillet at edges of floor slabs, be designed with a batter no steeper than 3H:1V.

**3-11.3.1.3. GTB Material Gradation.**

<u>Sieve Size</u>	<u>Percent Passing</u>
(4.75 mm) No. 4	100
(2.36 mm) No. 8	95 - 100
(2.00 mm) No. 10	75 - 95
(1.70 mm) No. 12	35 - 50
(1.18 mm) No. 16	0 - 10

**3-11.3.1.4. GTB Material Requirements**

Rock Type:	Basalt
Specific Gravity (ASTM C 128):	2.70 to 2.80
SiO <sub>2</sub> (ASTM C 289):	45% Minimum
L.A. Abrasion, % loss, 500 Revolutions (ASTM C 131):	20% Maximum
Moh Hardness Scale:	5 to 6

3-11.3.1.5. GTB material installed shall be clean and free of debris, dirt or other non-GTB material/substances that would compromise the GTB effectiveness. When GTB is installed in layers, the surface of the layer receiving additional GTB material shall be clean. Previously installed material if not clean shall be removed and replaced prior to installing additional GTB material.

3-11.3.1.6. Penetrations through the GTB other than that necessary for utility pipes/conduits shall not be made unless approved. Pipes laid in GTB material shall not be encased in sleeves or wraps that may provide a hidden path for termites. All utility pipes beneath the floor slab shall be encapsulated in minimum 100 mm (4 inches) of



GTB material.

3-11.3.1.7. GTB material shall be compacted using approved equipment and methods.

3-11.3.1.8. No structure or appurtenance that is not protected by GTB material shall be allowed to be in direct contact with the dwelling unit itself

3-11.3.1.9. The Contractor's Design Proposal shall include typical GTB installation details beneath the slab and at pipe penetrations.

3-11.3.1.10. The Contractor shall submit a CQC plan to limit GTB material displacement before and during concrete placement. This is to maintain GTB material integrity and thickness for protection against termite infestation, and to maintain structural integrity of slabs and foundations.

3-11.3.2. Capillary Water Barrier and Vapor Barrier. Except as indicated herein below, capillary water barrier and vapor barrier shall be placed beneath the concrete slab on grade. The capillary water barrier shall be 100 mm (4 inches) thick. The capillary water barrier material shall be a clean, crushed non-porous rock, crushed gravel or uncrushed gravel as approved. The maximum particle size shall be 40 mm (1-1/2 inches) and no more than 2 percent shall pass the 4.75 mm (No. 4) sieve. The capillary water barrier shall be compacted with a minimum of four (4) passes of a hand-operated, plate-type vibratory compactor. A vapor barrier shall be placed directly below the concrete slab and the GTB shall be installed under the vapor barrier but over a separation geotextile which is installed over the CWB layer.

The vapor barrier shall have the following properties:

Minimum 15-mil thick polyolefin geomembrane manufactured with ISO certified virgin resins.		
Water Vapor Transmission Rate	ASTM E-96	not exceeding 0.006 gr./ft <sup>2</sup> /hr.
Permeance Rating	ASTM E-96	not exceeding 0.015 gr./ft <sup>2</sup> /hr.
Water Vapor Retarder	ASTM E-1745	meets or exceeds Class B
Puncture Resistance	ASTM E-1709	minimum 1970 grams
Tensile Strength	ASTM D-638	minimum 45 lbf/in.

Properties shall be verified by independent laboratory testing and result submitted for review. Installation of the vapor barrier shall be per manufacturer's instructions with the following as the minimum; joints shall be lapped a minimum of 300 mm (12 inches) and sealed with the manufacturer's recommended mastic or pressure sensitive tape. The vapor barrier shall be lapped over footings or sealed to foundations and walls. The contractor shall check the vapor barrier surface, seams and penetrations at columns and utilities for damage and discontinuities prior to the concrete slab placement. The check shall be performed in the presence of the Contracting Officers Representative.

Standing water on the vapor barrier shall be removed prior to the concrete slab placement. The GTB shall be dampened, free of drainable water, and compacted the day before vapor barrier placement. The general contractor shall protect all exposed GTB surfaces from ponding of water or rainwater by sealing any entry points in uncompleted slabs or in unroofed buildings.

The separation geotextile shall have the minimum requirements for Class 2 as specified in AASHTO M 288-96 for geotextile survivability requirements. AOS requirements shall be compatible with the GTB and CWB gradation to provide an effective separation.

3-11.4. Earthwork for Building and Utility Systems shall be designed and constructed in accordance with industry standards unless otherwise specified herein or as approved.

3-11.4.1. **Satisfactory Materials.** Imported satisfactory materials shall be free from stones larger than 75 mm (3-inches) in any dimension.

3-11.4.2. Excavation Permits. Prior to start of excavation work, the Contractor shall obtain excavation permits from DPW & Verizon. A copy of the permit is included in Attachment, USAGH Excavation Permit. Contractor shall complete the DPW "Excavation Clearance Requirements" and submit the completed form to the Contracting Officer and DPW in order to obtain the following:

- a. "DPW Excavation Permit" for Water, Sewer, Storm Drainage, Electrical, Gas, Fuel lines, etc.
- b. Excavation Permit for telephone lines (communications) from Verizon and DPW.

Contractor shall carry both permits at all times during excavation.

3-11.4.3. Disposal. Excavated material not required or not satisfactory for backfill shall be removed from the site and disposed of off base.

3-12 **EROSION AND SEDIMENT CONTROL.** Erosion and Sediment Control Facilities shall be required in accordance with EPA's Storm Water Management for Construction Activities, EPA Document No. EPA-833-R-92-001, Chapter 3, OR local Erosion and Sedimentation Control standards and codes, whichever is more stringent.

3-13 **DEMOLITION.** Existing facilities scheduled for demolition shall be as indicated on the attached concept design drawings. Materials not owned by the Government and not used in construction shall be disposed of off government property. Obtain required demolition permits and disposal permits as required from City and County of Honolulu and Hawaii State Department of Health.. Obtain approval of the disposal site from the contracting officer and submit haul tickets for material disposed of off of Government property.

3-13.1 Existing utilities within the project limits shall be adjusted, relocated or modified as required to remain functional. The Contractor shall coordinate all utility adjustment work with the appropriate utility agencies/departments. The area within the project limits, which does not involve new construction, shall be graded smooth to drain, and planted with grass. All existing walks, parking and streets, drainage and utility systems at the interface with the demolition shall be properly coordinated and new construction provided for the continued functionality, operation and maintenance of adjoining and remaining facilities and systems. All existing utility structure and related appurtenances, which will not be utilized in the project shall be removed and disposed of. Abandonment in-place shall not be permitted unless approved by the Contracting Officer.

3-14 **CLEARING AND GRUBBING.** Clear and grub all trees and vegetation necessary for construction; but, save as many trees as possible.

3-15 **WETLANDS.** Jurisdictional tidal and non-tidal wetlands have not been identified on the project site. Determination has been made that jurisdictional wetlands are not on the site.

3-16 **EARTHWORK.** According to "The Soil Survey of Oahu, State of Hawaii" by the United States Department of Agriculture Soil Conservation Service in cooperation with the University of Hawaii dated August 1972, the typical soil type consists of *Kunia Series*. This series consists of well-drained soils on upland terraces and fans, which developed in old alluvium. They are nearly level to moderately sloping, where elevations range from 200 to 300 meters. The mean annual rainfall amounts to 760 to 1,015 mm, most of which occurs from November to April. The mean annual soil temperature is 228 C.

The general soil type within Schofield Barracks is identified as *Kunia Silty Clay (KyA)*. In a representative profile the surface layer is dark reddish-brown silty clay about 560 mm thick. The subsoil, 1,015 to 1,800 mm thick, is dark reddish-brown silty clay and silty clay loam that has a subangular blocky structure. The substratum is dark reddish-brown gravelly silty clay. The surface layer is medium acid to extremely acid, and the subsoil is slightly acid to strongly acid.

Permeability is moderate, while runoff is slow and the erosion hazard is no more than average.

**3-16.1 Earthwork for Building and Utility Systems** shall be design and constructed in accordance with UFGS Section 02315, Excavation, Filling and Backfilling for Buildings and Section 02316, Excavation, Trenching, and Backfilling for Utility Systems, unless otherwise specified herein or as approved.

**3-17 BORROW MATERIAL.** Obtain borrow material required for construction from sources off government property.

**3-18 WATER DISTRIBUTION SYSTEM.** The water distribution system shall be designed in accordance with Army standards contained in TM 5-813-5, Water Supply Distribution Systems and Military Handbook Fire Protection for Facilities Engineering, Design and Construction, (Mil Hdbk 1008c); and as indicated herein or approved. Construction materials, execution and testing shall be in accordance with UFGS Section 02510A, Water Distribution System; and as specified herein or approved. Where the requirements of the Army standards and the requirements defined herein disagree, the more stringent shall apply. The contractor shall determine the domestic and the fire demands for the facilities and shall verify the design of all components of the domestic and fire protection supply systems. Design of a water distribution system requires both domestic and fire flow demands be considered concurrently.

**3-18.1 Analysis of Existing System Capacity.** The existing water system consists of a series of 150 mm and 100 mm water lines as well as 75 mm laterals. A 150 mm water main taps into a 450 mm main along Waianae Avenue and a 200 mm main along Foote Avenue. 100 mm potable lines branch off the 150 mm main at the center of the courtyard and tie into the building service laterals. Two 75 mm service laterals are provided and tie into the building locations. Two existing fire hydrants located at the southwest and northeast corners of the courtyard provide fire protection to the Quad. Preliminary analysis results indicate that existing 450 mm water main along Waianae Avenue cross-connected with the 200 mm line along Foote Avenue has sufficient capacity to meet the required domestic and hydrant fire flow for the project. However, upgrades to the on-site water system will be required to provide adequate flows and pressures to the facilities. The existing 150 mm water lines in the Quad are inadequate to supply the required fire flow and pressure to the existing facilities (with clear wells turned off). Proposed water system improvements should include the following:

300 mm connection and backflow preventers at the 200 mm waterline on Foote Avenue and 450 mm waterline on Waianae Avenue; provide a 200 mm waterline for a looped system within the courtyard; building potable service laterals and fire hydrants should be connected to the new 200 mm looped water main; water lateral connection to the new chiller plant; water lateral connections to the new covered gear wash facility; replace existing 75 mm potable service laterals servicing the buildings with 100 mm laterals; install fire hydrants within Quad C courtyard at the northeast and southwest corners; provide service connection and backflow preventer to the fire pump house; provide a 200 mm looped system from the pump house to the service fire sprinkler system; provide 2 post indicator valves along the looped system for isolation; provide one 150 mm fire sprinkler line at each building and a post indicator valve at each fire sprinkler connection.

**3-18.2 Connections to Water Mains and Building Service Lines.** Connection points shall be as indicated in the concept design site and utility plan. The contractor shall be responsible for the design of the sizes, and means of connections to the existing system based on Facility requirements and system conditions.

**3-18.2.1 Connections to Water Mains.** Design the connections to the installation water system including the meter assemblies and the necessary backflow-preventing devices. Fire protection system shall be considered as that part of the distribution system supplying fire hydrants, or fire hydrant laterals. Service connections supply water from the main to the building. Mains shall be looped with no dead ends and be of adequate size to satisfy both domestic and fire flow requirements. Minimum main size is 200 mm [8 in]. Sufficient sectional control valves shall be provided so that no more than two fire hydrants will be out of service in the event of a single break in a water main. A copper tracer wire shall be placed directly above all non-metallic mains when plastic marking tape does not provide means of determining alignment of pipe by metal detecting

equipment.

#### 3-18.2.2 Building Connections.

3-18.2.2.1 Service lines shall be engineered with building interior plumbing to insure that wide fluctuations in pressure, water flow, and temperature do not occur. Meter head losses shall be included in design analyses hydraulic calculations for domestic services.

3-18.2.2.2 Building connection shall have an exterior shut off valve with valve box installed underground.

3-18.2.2.3 Service lines less than 80 mm (3 inches) shall be copper pipe and fittings, Type "K" or polyvinyl chloride (PVC). Piping 80 mm (3 inches) and larger shall be ductile or PVC unless other wised approved. PVC piping less than 100 mm (4 inch) diameter shall be schedule 80 with screw joint.

3-18.2.2.3 Backflow Prevention Device. Provide reduce pressure principle backflow prevention device for each building connection in accordance with C&C of Honolulu Standards BWS

3-18.3 **Trenches.** Water line trenches shall be of a depth to provide a minimum cover of 1 m (3 ft.) in areas subject to vehicular traffic and 0.70 m (2.5 ft.) in all other areas from the existing ground surface, or from the indicated finish grade, which ever is lower, to the top of pipe. Sufficient cover must also be provided to protect the pipe against structural damage due to superimposed surface loads. Lines installed with less cover than the minimums stated shall be concrete encased with a minimum concrete thickness of 150 mm [6 in].

3-18.4 **Fire hydrants.** Two fire hydrants shall provide as indicated on the Concept Design Drawings. Fire hydrants shall be compatible with those presently in use at the installation, with similar pump and hose connections. The maximum amount of flow that can be permitted shall be determined. Fire hydrant spacing shall be no greater that 150 m [500 ft] apart by paved road. In addition, a hydrant shall be provided so that all parts of the facilities can be reached by hose lines not over 105 m [350 ft] long. All distances shall be calculated along the closest route that the fire apparatus must travel (i.e.; along the curb or access lane). Each hydrant may account for a maximum of 95 liters per second [1500 gpm] of fire protection regardless of existing pressures or water line capacity. A fire hydrant shall be located within 15m [50 ft] from any fire department connection provided. Hydrant laterals shall be 150 mm [6 in] minimum size, and shall not exceed 15 m [50 ft] in length, and shall have an underground shutoff valve. Valve box, at each lateral, shall be located within 3 m [10 ft] of the hydrant, and shall not be located where obstructed by parked vehicles, shrubbery, etc. Guard post barriers shall be provided where hydrant locations are subject to vehicle damage.

3-18.4.1 Type and Nozzles. Fire hydrants shall be wet-barrel with one 4-1/2 inch and two 2-1/2 inch outlets, with the center of hose outlets a minimum of 0.45 m (18 inches) above finish grade. Each hydrant shall be furnished with a quick-coupler type adapter for the 115-mm (4.5-inch) outlet. Each hydrant supply shall be provided with minimum 6" connection through shutoff valve and isolation valve box.

3-18.4.2 Hydrant locations along streets shall be identified with approved raised blue pavement reflector markers offset 100 mm (4 inches) towards the hydrant from the road center

3-18.4.3 Hydrant Color. Exact color to be coordinated with the Contracting Officer.

3-18.4.4 Pipe Guards. Hydrants located adjacent to parking and roads shall be protected with 100 mm [4-inch] diameter x 1.2 m [4 feet] high concrete filled pipe guards. Pipe guard materials and installation requirements shall be in accordance with Department of Water Supply, Approved Material List and Standard Details for Water System Construction, Standard Detail 33.

3-18.5 **Shutoff Valve.** Each building shall be provided with a separate service and main shutoff valve, readily accessible to maintenance and emergency personnel. Shutoff valves in walks are prohibited.

3-18.6 **Metering.** Meters shall be provided to allow the monitoring of water consumption . Meters shall be remote sensing ready adequately sized to meet the building water flow and pressure demand. Maximum velocity

shall be 10 feet per second. Meters shall be located in accessible areas out of the way of vehicular traffic. Special requirements are as follows.

3-18.6.1 Meter shall be of one manufacturer and of the same model for a given size. Meter shall be of the displacement or vertical turbine type conforming to AWWA C701 Class II unless otherwise specified or approved. Meters shall be sized and of the appropriate type to insure adequate service pressures and flow can be maintained within manufacturer sizing recommendations. The main casing shall be bronze with stainless steel external fasteners. Registers shall be straight-reading type, shall be permanently sealed and shall read in U.S.-gallons. Digital indicator-totalizer shall be sealed and magnetically coupled with the driving mechanism. A leak detector hand shall be provided to indicate very low flow (due to leakage). Connections shall be suitable to the type of pipe and conditions encountered. Register type shall be an encoder-type remote register designed in accordance with AWWA C707. Remote mounting adapter kit with up to 15.24m (50 ft) of cable shall be used to connect the water meter to the remote sensor on the building. Meters shall comply with the accuracy and capacity requirements of AWWA C701. The method of remote monitoring must be coordinated with installation utility systems.

3-18.6.2 Meter Boxes. Meters shall be installed in approved meter boxes or vaults large enough for the installation of a shut off valve and meter and shall be large enough for easy maintenance and removal of meters. Meter registers shall be readily readable with reading ports in box covers provided. Shut off valves shall be provided on each side of meters. Straight pipe sections shall be provided when recommended by the manufacturer. Meters larger than 50 mm (2 inches) shall be provided with bypass line and valve of approved size. Meter boxes set in paved areas subject to vehicular traffic shall be cast iron, or concrete with cast iron lid and cast iron meter reader lid. Boxes set in sidewalks, not subject to vehicular traffic, shall be concrete with cast iron lid and cast iron meter reader lid. Plastic boxes and lids shall not be used. Box height shall extend from invert of the meter to final grade at the meter location. The lid shall have the word "WATER" cast in it.

3-18.6.3 Contractor shall as directed provide to the Contracting Officer for turn over to DPW a minimum of one-meter splice and one spare meter each size installed in this project.

### 3-18.7 **Water Mains.**

3-18.7.1 Materials for Fire Protection Distribution Main Extension. Materials for the water main shall be in accordance with Army and DPW installation standards. Mains shall be considered as that part of the distribution system that supply fire hydrants. Minimum main size shall be 200 mm (8 inches). Mains shall be ductile iron or Polyvinyl Chloride (PVC). All ductile iron pipes and fittings, to include couplings and valves, shall be wrapped with 8mil thick polyethylene encasement per AWWA C105. All mains shall be provided with commercial plastic marking tape specifically manufactured for this use. Tracing wire shall be copper solid #10 and shall extend in to valve box stations.

3-18.7.2 Water Main Clearances to Sewers. Water mains shall be laid horizontally 3 m (10 feet) or more from sanitary sewers. Exception is where the bottom of the water pipe is a minimum of 450 mm (18 inches) above the sewer pipe top, in which case, the horizontal separation shall be 1.8 m (6 feet) or greater. Service lines shall have a minimum vertical separation of 300-mm (12 inches) above sewer laterals unless otherwise approved. Where water mains cross within 450 mm (18 inches) above or any distance below gravity flow sanitary sewer lines, the sewer pipe shall be encased with an approved reinforced concrete jacket of 150 mm (6 inch) minimum cover around the pipe to a distance of 3 m (10 feet) horizontally from the water line. Encasement shall start and end at sewer pipe joints.

3-18.8 **Economic Analysis.** Deleted.

3-18.9 **Field Quality Control for Water Distribution.** The contracting officer will conduct field inspections and witness field tests specified. The contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing. Water needed for field tests will not be furnished by the government. Do not

begin testing on any section of a pipeline where concrete thrust blocks have been provided until at least 5 days after placing of the concrete.

**3-18.10 Bacteriological Disinfection.** Before acceptance of potable water operation, each unit of completed waterline shall be disinfected in accordance with UFGS Section 2510, Water Distribution System and AWWA C651 unless otherwise specified herein or approved. From several points in the unit, the Contracting officer will take samples of the water in proper sterilized containers for bacterial examination. The unit will not be accepted until satisfactory bacteriological results have been obtained. Contractor shall be responsible for neutralization of and proper disposal of testing and disinfection waters in accordance with State of Hawaii and Tripler Army Medical Center, Preventive Medicine Office, regulations, etc. The chlorinated water may be used for watering grassy areas if the chlorine concentration is reduced to that of drinking water.

**3-18.11 Lead Residual.** Following the bacteriological disinfection and testing, the system shall be flushed with a sufficient velocity of water and sufficient tests performed at each hot and cold water discharge point until no more than 15 ppb lead residuals remain in the system. All test and samples shall be performed in accordance with state and, if applicable, Federal regulations. Samples for testing are to be collected after a 6-hour continuous period of no flushing, and will be considered first draw samples. The commercial laboratory shall be certified by the state's approving authority for examination of potable water. Lead residual tests results shall be submitted to the Contracting Officer. The system will not be accepted until satisfactory bacteriological results and lead test residual test results have been obtained. All flushing and testing for lead residuals, including.

**3-18.12 Interruption of Water Supply.** Contractor shall inform the Contracting Officer a minimum of 45 calendar days in advance of any interruption of service in the existing water system. Valves shall be closed and opened only by DPW authorized personnel unless otherwise approved in writing. Maximum outage shall be 6 hours unless otherwise directed by the Contracting Officer.

**3-18.13 Pressure Reducing Valves.** Main line pressure reducing valves are not required in this project.

**3-18.14 Backflow Protection.** Potable water supplies to fire protection systems, including but not limited to stand pipes and automatic sprinkler systems, shall be protected from backpressure and back siphonage by a double check valve assembly. The valve assembly shall be located down stream of the post indicator valve and before the building riser pipe connection. Double check valve assembly shall in accordance with AWWA C506 and NFPA 24. Valve assemblies shall be of one manufacturer and of the same model for a given size. Domestic and irrigation water systems shall be protected by Reduced Pressure Backflow Preventers.

**3-18.15 Post Indicator Valves.** Every connection from a private fire service main to a building shall be provided with a listed indicating valve so located as to control all sources of water except fire department connections unless otherwise approved by the authority having jurisdiction. Post indicator valves shall be located not less than 12.2 m (40 ft) from buildings. When necessary to place a valve closer to a building, the indicator post shall be located at a blank part of a wall.

### **3-19 SANITARY SEWERAGE SYSTEM.**

Analysis of Existing System Capacity. Quad C is serviced by a series of 150 mm and 200 mm sewer lines, which collect the wastewater generated on site. The effluent is collected in a manhole located within the courtyard and directed northeast toward Waianae Avenue (SMH S300-50 via a 300 mm sewer main. From SMH S300-5 to SMH S200-2 along Waianae Avenue, the existing sewer main is only 200 mm in diameter. The draft Sewer Infrastructure Study (June 2001) for Schofield Barracks indicates that these lines are inadequate under peak flow conditions. Improvements shall include the following: Replace the existing 200 mm sewer line along Waianae Avenue (between SMH S300-5, S200-1 and S200-2) with a 300 mm sewer line; replace existing building sewer laterals with new 150 mm laterals and provide new sewer manholes and cleanouts as required; Replace existing 150 mm sewer line in courtyard with a new 200 mm line. Provide sewer lateral connection to new covered gear wash.

Sediment trap/ basin shall be provided at gear wash facility. Wastewater effluent shall be directed to the sewer system. The existing 150 mm sewer main between sewer manhole S300-19 and S300-15, which recently had CIPP, shall remain (Russell Leong, DPW 6-01).

3-19.1 Building Sewer Laterals and Connections. Laterals and building connections shall be designed and constructed in accordance with U.S. Army Corps of Engineers Technical Instructions TI 814-10, Wastewater Collection , UFGS standards and the latest edition of International Plumbing Code. Minimum diameter for laterals shall be 150 mm [6 in] while maintaining a minimum velocity of 45 meters per minute [2.5 fps]. Minimum pipe slope for 160 mm [6-inch] shall be 0.6 percent. Lateral shall be sized based upon fixture unit flow.

3-19.1.2 Laterals shall use standard "wye" fittings. Cleanouts shall be provided at all junctions and major bends as directed.

3-19.1.3 Cleanouts shall be 6" cast iron pipe. They shall be installed on all building connections to provide a means for inserting rods in to the underground pipe and installed flush with the finish ground to preclude damage to mower equipment and tripping. Two-way cleanout shall be provided at building connections to permit complete rodding of the building connection. Preferably the cleanout will be of the same diameter as the building sewer, and never smaller than 150 mm (6-inches). Cleanout cap shall be recess type. Cleanout tops in grassed areas shall be provided with a 375 mm (15 inch) square by 150 mm (6 inch) thick concrete collar reinforced with #3 rebar on all sides.

3-19.2 Trenches. Sewer and water lines, mains or laterals, shall be placed in separate trenches. The separate trenches shall maintain a minimum lateral separation of 3m [10 ft].

3-19.3 Minimum Sewer and Water Distribution Pipe Separation Requirements. Parallel water and sewer pipe and crossings between water and sewer pipe shall be in accordance Chapter 4, Site Engineering, sub para. Water Main Clearances to Sewer.

3-19.4 Cover. Coordinate with building connection requirements. To prevent the pipe from being crushed by construction vehicles and the design vehicle, the minimum cover above the top of pipes shall be 750mm [30 in] unless pipe materials are used and/or unless the pipe is concrete encased with a minimum of 150 mm [6 in] thickness of concrete.

3-19.5 Pipe Material for Sewer Laterals. Pipe material for laterals shall be plastic pipe with minimal pipe joints.

3-19.6 Manholes. Manholes shall be constructed of concrete or precast concrete manhole sections with minimum 30" access openings. Ladders shall be stainless steel.

3-19.6.1. Precast manholes shall have eccentric cone tops to permit vertical descent within the manhole.

3-19.6.2 Manholes shall have essentially watertight walls and pipe connections to control ground water infiltration.

3-19.6.3 Manholes deeper than 900 mm (3 feet) shall have stainless steel ladders, Type 316 Stainless Steel (SS).

3-19.6.4 Each new or modified manhole that is located in roads or grass areas that are located in low areas subject to flooding shall be installed with manhole cover inserts to prevent inflow of rainwater; reduce manhole rattling and flipping due to street traffic; and prevent dirt and debris from entering collection system through manhole cover. Manhole insert material and dimensions shall be in accordance with City and

County of Honolulu Standards and as specified herein.

3-19.6.4.1 The inserts shall be made of corrosion proof material suitable for atmospheres containing hydrogen sulfide and diluted sulfuric acid as well as other gases associated with wastewater collection. The body of the material shall be made of high density polyethylene co-polymer, or approved equal that meets ASTM Specifications Designation D1248, Class A, Category 5, Type III, equal to Marlex HXM 50100 (extra high molecular weight hexene co polymer).

3-19.6.4.2 The manhole inserts shall have a minimum impact brittleness temperature of 105 degrees Fahrenheit or less. The thickness shall be uniform 1/8-inch or greater. The material shall be firm enough such that the inserts will not fold and fall into the manhole due to any accumulation of debris and water. It shall also be resistant to environmental stress cracking.

3-19.6.4.3. The gasket shall be made of closed cell neoprene. The gasket shall have pressure sensitive adhesive on one side and be placed under the weight bearing surface of the manhole insert by the manufacturer. The adhesive must be compatible with the insert material to form a long lasting bond in wet or dry conditions.

3-19.6.4.4 A lift strap shall be attached to the rising edge of the bowl of the manhole inserts with a stainless steel rivet. The lift strap shall be made of one-inch (1") wide, woven polypropylene web and sheared on all cut ends to prevent unraveling. The inserts shall be sized to fit City and County of Honolulu Standard Type SA manhole frame and covers.

3-19.6.5. New manholes should be located to avoid bends 90 degrees or larger.

3-19.6.6 Drop Manholes, if required, shall be in accordance with City and County of Honolulu standards.

3-19.6.7 Abandoned Manholes and Sewer lines. Abandoned sewer lines should be plugged with concrete at each end. The concrete plug shall extend from the manhole to a minimum 0.6 m (2 ft.) into the abandoned line. Abandoned manholes shall have the bottoms cracked to permit subsurface water drainage through the bottom. The manhole shall be backfilled with (a) compacted granular material, base course or S4C or (b) lean concrete. The manhole cover should be completely removed along with the manhole cone or the upper 1 m or (3 ft.) for cast-in-place manholes.

3-19.7 Pipe material for sewer mains and laterals shall be plastic pipe within minimal pipe joints

3-19.8 Field Quality Control for Sanitary Sewer Distribution System. The contracting officer will conduct field inspections and witness field test specified. The contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing. Water needed for field tests will not be furnished by the government.

3-19.9 Interruption of Sewer System. Contractor shall inform the Contracting Officer a minimum of 45 calendar days in advance of any interruption of service in the existing sewer system. Maximum outage shall be 6 hours unless otherwise directed by the Contracting Officer.

3-19.10. Sewer Pipe Joints. Sewer mains within the tree drip line shall be wrapped at the joints with a 'bio' or root type barrier membrane. Root barrier shall be suitable for pipe joint wrap application and shall be installed in accordance with the manufacturer's specifications.



3-20 **STORMWATER MANAGEMENT SYSTEMS.** The storm drainage system shall be properly coordinated with surrounding properties to ensure that runoff does not cause damage to other properties. All storm water management calculations shall be based upon a 10-year storm frequency. Design storm water management systems in accordance with the applicable requirements of “Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPS”, by the Department of Environmental Programs or in accordance with the requirements of the agency having jurisdiction. The calculation of runoff and the evaluation of existing storm sewer drainage systems shall be as described herein paragraph entitled “Grading and Drainage”. Obtain required permits from the agency having jurisdiction prior to construction. Coverage by a National Pollutant discharge elimination System (NPDES) General permit for Storm Water Associated with Construction Activities shall be obtained.

3-20.1 Analysis of Existing System Capacity. The Quad C elevations range from 262.4 meters to 263.3 meters with the low point of the site being the south corner of the complex between Buildings 357 and 358. Presently, the accumulated runoff generated on-site is collected through a series of curb inlets and drain lines and directed to a drain manhole located along Foote Avenue. In addition, downspout roof drains tie into the drainage system at various locations throughout the site. The existing storm drainage system consists of 100 mm; 200 mm and 300 mm drain lines, which are considered to be inadequate.

3-20.2 Storm Water Retention/Detention System for Volume Control. Not required/applicable.

3-20.3 Storm Water Retention/Detention System for Runoff Treatment. Not required/applicable.

3-21 **GRADING AND DRAINAGE.**

Storm drainage system design shall be designed in accordance with City and County of Honolulu Storm drainage Standards and as specified herein or approved. Construction materials, execution and testing shall be in accordance with UFGS/CEGS Specification Section 2630a, Storm Drainage System; and as specified herein or approved.

3-21.1 The proposed drainage improvements should include the following (drain line sizes provided are preliminary and should be verified by the civil designer):

- System design and capacity requirements should accommodate 10-year design flows.

- Install new 150 mm downspout laterals and cleanouts, as required.

- Install new 200 mm downspout drain line at the building perimeters. Downspout laterals should tie into new 200 mm downspout drain line at designated points along the building perimeters.

- Remove and replace existing curb inlets within Quad C.

- Install new 300 mm, 450 mm and 600 mm drain lines, as required to provide for adequate drainage of the site. Install additional drain inlets, as required.

3-21.2. Connections to Existing Systems. Connections to existing systems shall be made at locations as indicated on the drawings or as approved.

3-21.3. Grading and drainage design shall be properly coordinated with surrounding properties and facilities to insure that runoff do not cause damage outside of the project limits. Existing drainage patterns

shall be maintained as much as practicable.

3-21.4. Sumps and low points where water ponds shall be avoided whenever practical so as to preclude flooding of buildings and roads when design capacities of drainage systems are exceeded. Where sumps can not be avoided, higher design capacities may be directed for systems draining the sumps and positive overland flow relief provided to preclude flooding of dwelling units and critical utility appurtenances such as electrical transformers.

3-21.5. Inlets and Manholes.

3-21.5.1. Materials shall be of cast-in-place reinforce concrete or pre-cast reinforced concrete sections. Precast manholes shall have eccentric cone tops to permit vertical descent within the manhole.

3-21.5.2. Locate manholes or inlets at intersections, changes in alignment or grade or size, at junctions with laterals of branches or wherever entry for maintenance is required. Storm drain inlets shall be located so that no collection swales flow across a street or sidewalk to reach a storm drain other than where cross gutters are used. For streets and roadways, side opening catch basins are preferable. Distance between points of entry will not be more than 90 meters (300 feet) for conduits with a minimum diameter smaller than 30 inches and up to 150 meters (500 feet) for diameter 30 inches or larger.

3-21.5.3. Inside dimensions of manholes will not be less than 0.760 meter (2.5 feet). Inside dimensions of inlets will provide for not less than 75 mm (3-inches) of wall on either side of the outside diameter of the largest pipe involved or not less than 0.760 meter (2.5 feet), which ever is greater.

3-21.5.4. Manhole frame and cover shall be round with a minimum clear opening of 760mm (30 inches).

3-21.5.5. Manholes and inlets deeper than 900 mm (3 feet) shall have a fixed stainless steel ladder, Type 316 Stainless Steel (SS).

3-21.6. Open ditches and channels are not allowed unless specifically approved. Grassed swales shall have a one (1) percent minimum invert slope unless the invert is paved with and approved concrete lining. Open areas shall be drained by field inlets and an underground collection system, utilize existing system as much as possible. Overland flow shall be held to a minimum. Swales shall have cross-sections that do not restrict the use of powered mowing equipment.

3-21.7. All streets shall be crowned or sloped to drain. Concrete gutters shall be provided on both sides of streets. Street drain inlets shall be curb opening type. Drop inlets with grates are not allowed.

3-21.8. Maximum Gutter Flow. Maximum flow in all gutters shall be restricted to the quantity, which will cause flooding of 1/2 of the adjacent traffic lane at the design storm. When this flow is reached, it shall be intercepted by catch basins and removed to an underground drainage system.

3-21.9. Minimal size for drain pipes along roadways and vehicle traffic areas shall be 450 mm (18-inches) and pipe material reinforced concrete. Minimal pipe size for all other areas shall be 300 mm (12-inch) and materials shall be reinforced concrete pipe, schedule 40 PVC pipe, or smooth interior corrugated polyethylene pipe. For corrugated polyethylene pipe, the couplings joints shall be the watertight type.

3-21.10. Storm Runoff Calculation. Storm runoff shall be calculated with consideration for the following:

3-21.10.1 Select design values to be used in the storm drainage design calculations, including rainfall intensity, drainage area, and runoff coefficients.

3-21.10.2 Select storm drainage plan with respect to planned connections to the existing storm drainage system, when applicable.

3-21.10.3 Alternate schemes considered in arriving at selected storm drainage plan.

3-21.10.4 Principal means of collection and disposal of storm water in the new storm drainage system. Include calculations for runoff, sizing of pipe and drainage structures (inlets and drainage control structures and roof drainage pipe).

3-21.10.5 Method proposed for handling roof runoff from gutter downspouts (roof drain collector system into drainage system).

3-21.10.6. Connections of building's mechanical drains to outside drainage system, where applicable, and cross referencing to the appropriate section and design discipline, when required.

3-21.11 Specific Storm Drainage Criteria.

A 10-year 1-hour intensity design storm shall be used to calculate the runoff. The time of concentration (Tc) for storm drainage system shall be no less than 10 minutes for paved areas and 20 minutes for turfed areas. Runoff shall be controlled by a storm drainage system properly designed to eliminate erosion.

Storm drainage systems will be so designed that the hydraulic gradeline for the computed design discharge in as near optimum depth as practicable and velocities are not less than 0.760 m/s/2.5 feet/s when drains are one third or more full.

3-21.12 Sidewalk Culverts. Sidewalk culverts are not permitted.

3-21.13 Materials. All materials shall be in accordance with the criteria indicated above.

3-21.14 Field Quality Control for Storm Drainage System. The contracting officer will conduct field inspections.

Testing procedures and requirements shall comply with the requirements indicated above.

**3-22 PAVEMENT DESIGN CRITERIA.** For bidding purposes, the pavement design shall be in accordance with the preliminary soils report. The final soils report by the successful bidder will determine the final pavement design. Concrete curb and curb/gutter shall be as shown on the drawings and this RFP. For streets and roads, the design vehicle traffic and anticipated volume will be given to the successful bidder.

**3-23 PERMIT REQUIREMENTS.** Timely acquisition of all the necessary design and construction related permits shall be the responsibility of the contractor. As some permit process times take 6 months or more, the Contractor, upon notice to proceed, shall immediately begin working on the permits so as not to delay completion of the project. The following permits have been identified as being required for this project: State Department of Health Individual Wastewater Permit, U.S. Army Garrison Hawaii, Excavation Permit, Demolition Permit, County of Hawaii Disposal Permit and any other permits as required by the installation, County and State Government.

**3-24 GAS DISTRIBUTION SYSTEM.**

**3-24.1 General:** The site gas distribution system shall be coordinated with The Gas Company. The site gas system shall be sufficiently sized for the central plant hot water generation system and the Dining Facility, Bldg. 357.

**3-25 HEATING HOT WATER AND CHILLED WATER DISTRIBUTION.**

**3-25.1 General:** TI 810-32, Heating and Cooling Distribution Systems provides baseline design criteria, standards, policy and guidance for the design of the heating hot water and chilled water distribution systems. Designs shall be compatible with existing construction provided this does not conflict with criteria, standards and policy in TI 810-32.

**3-25.1.1 Codes:** Electrical systems and installation requirements shall adhere to the current editions of UFGS 02555A, Prefabricated Underground Heating/Cooling Distribution System.

**3-25.1.2 Standards:** All materials and appurtenances provided under this contract shall be suitable for the intended application and shall conform to the current edition of applicable standards of references indicated in UFGS 02555A, Prefabricated Underground Heating/Cooling Distribution System.

Where no such standards exist for any product provided under this contract, the Contractor shall demonstrate the suitability of the product, for the application intended, to the satisfaction of the Contracting Officer.

**3-25.3 Calculations and Diagrams:** Complete plans and diagrams shall be provided with calculations of flow and pressure. Diagrams, calculations, and drawings shall be prepared under the supervision of a United States registered professional mechanical engineer.

**3-25.3.1 Pipe size:** The size of pipe shall be selected such that flow velocity not exceed 2.13 m/s (7 fps).

**3-25.4 Buried Pipes**

**3-25.4.1 Thrust Blocks:** Thrust blocks shall be provided at any change in pipe direction. Thrust blocks shall be designed and shall be of sufficient size to prevent movement of the pipe due to change in flow.

**3-25.5.1.2 Direct Buried Pipes:** Pipes shall be prefabricated, insulated pipes with steel carrier pipe and PVC jacketing. Where bottoms of trenches comprise materials other than sand or stone-free earth, 76 mm (3-inch) layers of sand or stone-free earth shall be laid first and compacted to approximate densities of surrounding firm soil before installing ducts in direct-contact tiered fashion. Joints in adjacent tiers of duct shall be vertically staggered at least 152 mm (6 inches). The first 102 mm (4-inch) layer of backfill cover

shall be sand or stone-free earth compacted as previously specified.

3-25.5.1.3 Duct Line Markers/Plastic Marking Tapes: Duct line markers shall be provided at the ends of long pipe runs or for other piping whose locations are indeterminate because of changes in direction or terminations at completely below-grade structures. A 5-mil brightly colored plastic marking tape not less than 152 mm (6 inches) in width and suitably inscribed at not more than 3048 mm (10 feet) on centers with a continuous metallic backing and a corrosion resistant 1-mil metallic foil core to permit easy location of the pipe, shall be placed approximately 305 mm (12 inches) below finished grade levels of such lines.

**3-26 STEAM DISTRIBUTION.** Deleted..

**3-27 FUEL OIL STORAGE AND DISTRIBUTION.** Deleted..

**3-28 LIQUEFIED PETROLEUM GAS STORAGE AND DISTRIBUTION.** Deleted.



## CHAPTER 5

### ARCHITECTURAL DESIGN

**5-1 DESIGN GOALS.** Overall architectural goals for the Whole Barracks Renewal Brigade Complex QUAD C are to provide a functional, visually appealing campus of facilities that is a source of pride for residents, other facility users, and the installation. This chapter applies to all buildings under this RFP unless specifically noted otherwise.

5-1.1.1 The architectural floor plan is established and approved as shown in the RFP Concept Design Drawings. All architectural criteria must be met and accounted for, see paragraph 5-2 Applicable Codes and Standards. Any changes shall be brought to the attention of the Contracting Officer for resolution in writing.

5-1.1.2 Furnishings, Fixtures and Equipment (FF&E): FF&E is part of this project. Fixtures and Equipment (lighting, plumbing, mechanical equipment, etc.) described for programmed spaces shall be provided by the offeror as part of the base bid. Interior Furnishings (tables, chairs, sofa, bed, etc.) will be Government furnished and installed. Refer to SOW Chapter 2, para. 2-1.7 for scope of Furnishings, Fixtures, and Equipment that will be required to be provided by the offeror. Any furniture layout depicted in the RFP concept design drawings will be adhered to and not deviated from without approval of the customer. The number and location of furnishings serve as an indicator of the number of power, data and communications connection points. See electrical section for more detail.

**5-1.2 Existing Quad Building Background and New Space Planning Intent**

The existing Quad consists of four buildings-three stories each - constructed in 1917. The buildings were originally open sleeping and living spaces and until recently, a mixture of office and living spaces.

5-1.2.1 Building 355: ground floor will be used for heavy equipment storage for four medium and one large Company Operations Facilities (COFs). The second floor is designated for the Administration Offices for three medium COFs. The third floor is designated for the Administration Offices for one medium COF and one large COF. Also, the third floor will contain the existing refinished Gymnasium. The total area of Building 355 is approximately 6,160 SM.

5-1.2.2 Buildings 356 and 358: is reserved exclusively for Unaccompanied Enlisted Personnel Housing (UEPH), Laundry Room, and Game Room. It will have 50 sleeping rooms per floor for a total of 150 rooms per building. The total area of Building 356 & 358 is approximately 6,820 SM per building.

5-1.2.3 Building 357: ground floor will be designated as the Dining Facility; the space includes: Kitchen, sit down dining area, and dining support spaces. The second floor will have Soldier Support Services, Soldier Community Functions, Troop Aid Station, COF Restroom facilities, Dining area, and Classrooms. The third floor will contain the Battalion HQ functional spaces and Battalion Restroom facilities. Building 357 is approximately 6,966 SM.

5-1.2.4 The selected offeror will be required to demolish all of the existing interior partitions as well as the complete flooring system in the toilet and shower areas. **Also, the selected offeror will be required to determine the location of existing partitions with respect to the proposed Concept Design Drawings, in order to remove as required.** This may include concrete masonry walls that are not structural. The roof structure and roofing will also have to be removed for Buildings 356, 357, and 358. All buildings will require the removal of existing windows and doors and provide a larger opening to install new fenestrations (door & windows) as designed to meet the approval of State Historic Preservation Office (SHPO). Adjacent wall finishes, both interior and exterior shall match the existing surfaces before the new windows are installed. Additionally, all existing plumbing, mechanical and electrical items need to be removed as indicated. For existing as-built drawings refer to Attachment No. 28 for Quad C RFP Information Drawings: contents include topographic survey and Building 355/356/357/358 floor plans.

5-1.2.5 The Quad C building renovation design intent is to follow the Department of the Army Facilities Standardization Program for a Standard Company Operations Facility, Battalion Headquarters, and Dining Facilities.

5-1.3 **Exterior Design Objectives.** Design buildings to enhance the visual environment of the installation. Exterior materials, roof forms, and detailing shall comply with the Installation Design Guide and concept design drawing, and shall be compatible with the immediate local context. Use durable, low-maintenance materials.

5-1.4 **Interior Design Objectives.** Arrange spaces in an efficient, functional manner. Provide simple circulation schemes that allow easy way finding within buildings. Use durable materials and furnishings that can be easily maintained and replaced. Maximize use of day lighting and operable windows. Use interior surfaces that are easy to clean and light in color; avoid trendy or bright color schemes. Provide telephone/data jacks on multiple walls to allow optional locations for furniture. Structure interior spaces to allow maximum flexibility for future modifications; companies and battalions often change size or mission, requiring reconfiguration of facilities. Refer to SOW Chapter 14-Comprehensive Interior Design for detailed information and CID Package requirements.

5-1.5 **Material and Product Selection Criteria.** Materials shall meet the requirements of the SOW. The SOW includes a range of specificity: some material requirements are specific (no option); other material requirements allow a range of options. The SOW requirements establish a minimum quality level.

**5-2 APPLICABLE CODES AND STANDARDS.** Except as specified otherwise in the RFP, design and construction of facilities shall comply with the latest editions (as of the date of the RFP) of the following. Major criteria and references for building design are as listed but not limited to this list. Additional requirements are included throughout the RFP.

5-2.1 National Fire Codes, published by the National Fire Protection Association (NFPA), including NFPA 101 Life Safety Code.

5-2.2 International Building Code (IBC), 2000

5-2.3 Americans With Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG), 1998.

5-2.4 Unified Facilities Criteria (UFC) 4-010-01 Department of Defense Minimum Antiterrorism Standards for Buildings July 31, 2002.

5-2.5 AR 190-11, Physical Security of Arms, Ammunition, and Explosives, Change 1, Appendix G, para G-2.

5-2.6 American Architectural Manufacturer's Association (AAMA)

5-2.7 Architectural Woodworking Institute, AWI Quality Standards

5-2.8 Builders Hardware Manufacturers Association, ANSI/BHMA

5-2.9 Underwriters Laboratories.

5-2.10 Tile Council of America (TCA) Handbook for Ceramic Tile Installation.

5-2.11 The Schofield Barracks Installation Design Guide (IDG), excerpts of which are included in an appendix to the Statement of Work.



5-2.12 UFC 3-600-01 Design: Fire Protection Engineering for Facilities (17 April 2003)

5-2.13 TI 800-01, Design Criteria, 20 July 1998

5-2.14 UFC 1-200-01, Design: General Building Requirements, July 31, 2002

5-2.15 Department of the Army Facilities Standardization Program, Standard Company Operations Facility, Dated February 1994.

5-2.16 Department of the Army Facilities Standardization Program, Standard Design for Brigade and Battalion Headquarters Facility, Dated August 1995.

**5-2.17** AR 190-51, Security of Unclassified Army Property (Sensitive and Nonsensitive), Appendix B.

### **5-3 IBC OCCUPANCY AND BUILDING TYPE CLASSIFICATIONS.**

5-3.1 **General.** Occupancy classifications, construction types, allowable areas, maximum building heights, and fire separation requirements shall comply with the requirements of the International Building Code. Prior to issuance of the RFP, the design district shall coordinate with the authority having jurisdiction to determine occupancy classifications. Consult with the users to determine the hazard classification of items to be stored in the supply spaces.

5-3.2 **Construction:** All four building are Type II-A structures. All structural components, floor construction, bearing walls, and the roof shall be constructed of one-hour fire resistive construction.

5-3.3 **Occupancy Classification.** The IBC occupancy classification for the quad is as follows. Buildings 356 and 358 are both a Group R-2 occupancy. Building 355 is a mixed occupancy. The first floor is a Group S-1. The second floor is a Group B and Group S-1. The third floor is a Group A-3 and a Group B. Building 357 is also a mixed occupancy. The first floor is a Group A-2 and Group B. The second floor is a Group B and Group S-1, and the third floor is a Group A-3, Group B, and S-1.

5-3.4 **NFPA Classification.** The NFPA 101 classification for the quad is: Buildings 356 and 358 are both New Apartment Building occupancies. Building 355 is a mixed occupancy. The first floor is a Storage occupancy. The second floor is a New Assembly occupancy, New Business occupancy and a Storage occupancy. The third floor is a New Assembly occupancy, and a New Business occupancy. Building 357 is also a mixed occupancy. The first floor is a New Assembly occupancy, and a New Business occupancy. The second floor is a New Business occupancy and a Storage occupancy, and the third floor is a New Assembly occupancy.

5-3.5 **UEPH Buildings.** Occupancy classification: Residential R-2.

5-3.6 **Company Operations Facilities** Occupancy classification of administrative areas, and locker room facilities serving less than 50 occupants: Business Group B. Common Locker Rooms for 50 or more occupants: Assembly Group A-Division-3. Occupancy classification for supply areas: Storage Group S, Division 1 (or Division 2- verify contents of space with user).

5-3.7 **Battalion Headquarters.** Occupancy classification of administrative areas: Business Group B. Occupancy classification of classroom areas: Assembly Group A-3.

### **5-4 EXTERIOR DESIGN.**

5-4.1 **General** the buildings are considered historical and any exterior construction shall be

sensitive to the original design. See the Historic Narrative for detailed narrative on the historic importance, general design intent and requirements, see SOW 15. The exterior design should closely replicate the original 1917 design. The Concept Design Drawings contrast the original design where the building must conform to NFPA 101, Life Safety Code. Some of the areas include the exterior stairways; rated partitions and doors are added to enclose the stairs. Also, some window and door openings were removed to provide a separation when enclosing the stairs was not practical.

5-4.2 **Acceptable Materials and Colors.** Exterior elements of the facilities shall comply with the attached architectural concept design drawings and the Installation Design Guide (IDG) unless required otherwise by applicable codes or this Statement of Work

5-4.3 **Quad Building Superstructure:** No specific requirement for the type of structural system is imposed other than to meet the applicable regulations, to dimensionally fit within the space allocated for structure and to accommodate the exterior materials shown on the exterior elevations and building sections.

5-4.4 **Detached Building Structures.** Concept design is based on a load-bearing masonry exterior wall with a manufactured steel truss roof structure.

5-4.4.1 Alternative pre-cast concrete beams or trusses, pre-engineered steel structure, or conventional steel rafter / purlin systems.

5-4.5 **Exterior Closure:**

5-4.5.1 **Exterior Finishes.** Emphasis shall be placed on low maintenance and durability for exterior finish materials. Materials shall be residential in size, scale, and texture. Exterior wall materials shall be painted concrete or concrete masonry unit:

5-4.5.2 Termite decay and protection for exterior wood materials (siding, trims, etc.) shall be in accordance with National Wood Window and Door Association (NWWDA) Standards. Each piece of treated material shall bear identification of the testing agency to indicate performance in accordance with NWWDA.

5-4.5.3 Trim elements. Aluminum or vinyl clad wood trim is preferred over painted or stained wood trim. Painted exterior surfaces shall be minimized. When exterior exposed wood trim is used the following requirements apply:

5-4.5.4 Exposed wood, such as window trim, door sills, window sills, railings and balusters, trellis, wood fencing, arbors, solar shading devices including louvers, arbors, and trellis shall be treated for rot resistance in accordance with NWWDA Industry Standards I.S.4, Water Repellent Preservative Treatment for Millwork.

5-4.5.5 Exterior surfaces requiring painting shall receive a minimum of one prime coat and two finish coats of paint. Wood trim frames, etc., shall be back primed. Exterior semi-transparent low sheen stains, two coats, are acceptable, where appropriate for wood, plywood, etc.

5-4.5.6 Existing exterior stair treads and landings shall be provided with non-slip type treads. Existing exterior stairs shall be provided with metal railings.

5-4.6 **Roofs.** Roofing material and color shall comply with the attached architectural concept design drawings. Roofing system shall have Underwriters Laboratory (UL) Class A rating for fire resistance, UL 90 wind resistance rating, and Factory Mutual (FM) 1-90 fire and wind resistance rating.

5-4.6.1 **Quad Building, Chiller Plant Building and Pump House Building Roofs.** Built-up roofs shall have a minimum pitch of 1:24 (1/2-inch: 1 foot.).

5-4.6.1.1 **Built-Up Roofing.** Provide 4-ply, built-up roofing for use over rigid board insulation on metal

decking for Quad Building Roofs. Provide 4-ply, built-up roofing for use over rigid board insulation on concrete slab of metal decking for Chiller Plant and Pump House Building. Provide manufacturers 20-year finish warranty.

5-4.6.2 **Gear Wash/Recreation Building Roofs.** Gear Wash/Recreation Building shall have sloped roof with a minimum pitch of 4:12. Refer to Attachment #25, Quad F Gear Wash/Recreational Building Sketches.

5-4.6.2.1 **Metal Roofing.** Standing seam steel or aluminum roof panels with integral or metal fascias. Provide manufacturers 20-year finish warranty.

5-4.6.3 **Roof water.** Conductor heads, scuppers and downspouts shall be provided for all roof areas. Provide calculation of gutter and downspout size if the existing conductor heads, scuppers and downspout dimensions cannot be determined. Calculations should be in accordance with SMACNA-03, Architectural Sheet Metal Manual. Provide 20-year manufacturers finish warranty. Downspouts draining onto a lower roof shall have metal or plastic splash deflectors. Downspouts shall be connected to the underground storm drainage system. Provide cast iron boot at the bottom of all downspouts.

5-4.6.4 **Rainfall Calculations:** Conductor heads, scuppers and downspouts shall be adequately sized to meet the following Design Rainfall Intensities:

Schofield Barracks: Design Rainfall Intensity (hourly in inches for a 5-minute period to be expected once in 10 years) = 188 mm (7.4 inches).

5-4.6.5 **Roof surface.** Roof surfaces shall be light colored to minimize heat gain. Roof water shall be diverted away from entrances and foundations.

5-4.6.6 **Roof Eave.** Existing Quad Building roof eave shall be removed and restored to its original Historic design and character. Use durable, low-maintenance materials. Refer to Architectural Concept Design Drawings for detail reference.

5-4.6.7 **Sheet Metal Work.** All Sheet metal material shall be copper.

Note: Flashing - Continuous stepped flashing to be installed at wall adjacent to roof slope. Design to facilitate easy maintenance and removal of roofing without removing or damaging the wall sidings. Provide metal drip edge of flashing at roof eaves.

5-4.7 **Trim and Flashing.** Materials shall comply with the RFP concept design drawings. Gutters, downspouts, and fascias shall be copper; comply with SMACNA Architectural Sheet Metal Manual; provide 20-year manufacturers finish warranty.

5-4.8 **Miscellaneous Exterior Elements.** Comply with the attached architectural concept design drawings. It is advisable to prohibit any use of exterior wood with painted finish; require pre-finished metal trim. Coordinate with user to include requirements for any building-mounted operational items such as communications antennae, special lighting, warning beacons, etc.

5-4.9 **Exterior Doors and Frames.**

5-4.9.1 **Doors.** Provide Historic doors as indicated on the concept design drawings. Refer to RFP concept design drawings for door types and details. Fully glazed doors shall comply with wind load requirements of applicable codes. Telecom Room doors shall be secured per AR 380-19 Information Systems Security.

5-4.9.4.1 **Hollow Metal Doors and Frames.** comply with ANSI A250.8/SDI 100. Doors shall be Level

3, physical performance Level A, Model 2; insulated; top edge closed flush. Frames shall be Level 3, 14 gauge, with continuously welded corners and seamless face joints. Doors and frames shall be constructed of hot dipped zinc coated steel sheet, complying with ASTM A653, Commercial Steel, Type B, minimum A60 coating weight; factory primed. Anchors and accessories shall be zinc coated. Frames in masonry shall have bituminous back-coating, plaster guards, and shall be grouted solid. Provide concealed wall and head anchors in frame sufficient to support the weight of the grouted frame. Provide minimum four concealed wall anchors at masonry rough openings. Provide minimum one concealed head anchor for frame rough openings greater than three feet. Fire-rated openings shall comply with NFPA 80, and the requirements of the labeling authority.

#### 5-4.9.5 **Exterior Door Finish Hardware.**

5-4.9.5.1 **Hinges.** ANSI/BHMA A156.1; template, full mortise, heavy duty, anti-friction ball bearing, minimum size 114 mm x 114 mm [4 ½" x 4 ½"], stainless steel, non-removable pins.

5-4.9.5.2 **Locksets for Typical Exterior Door.** Provide stand-alone programmable electronic door locksets with audit capabilities. The lockset construction shall be all-metal, heavy-duty, and mortise. The lockset is equipped with hidden mechanical key override, an anti-pick latch and dead bolt, and a magnetic stripe reader. Each magnetic stripe card will be programmed to gain access into its respective module and sleeping/living rooms. Lockset shall be similar to Kaba Ilco, Solitaire 710-II Series or approved equal. The lockset shall include knob and lever torque test and "Ultra" finish with two-year warranty.

5-4.9.5.3 **Locksets for Typical Exterior Utility and Maintenance Doors.** spaces with doors covered by this paragraph include: Mechanical Rooms, Electrical Rooms, Telecommunication Rooms, Communication Rooms, Toilets, Janitor, and Stairwell. ANSI/BHMA A156.13; series 1000, grade 1, mortise lockset with removable core, non-ferrous base metal.

5-4.9.5.4 **Exit (Panic) Devices.** ANSI/BHMA 156.3; heavy-duty touch-pad type, through-bolted mounting. Listed and labeled for panic protection based on UL 305. Doors shall be provided with exit device if required by Building Code.

5-4.9.5.5 **Closers.** ANSI/BHMA A156.4; series C02000, Grade 1, hydraulic, factory-sized, adjustable to meet field conditions. Provide for all exterior doors, all doors to living units, and all doors opening to corridors and as required by codes. At exterior doors to lobbies, corridors, mechanical rooms, janitors closets, and COF supply areas provide overhead holders or closers with hold-open capability.

5-4.9.5.6 **Auxiliary Hardware.** ANSI/BHMA A156.16. Provide wall or floor stops for all exterior doors that do not have overhead holder/stops. Provide solid wood backing in the stud wall cavity for wall-mounted doorstops. Provide other hardware as necessary for a complete installation.

5-4.9.5.7 **Thresholds.** ANSI/BHMA A156.21; non-ferrous metal. Provide at all exterior doors. Provide inter-locking type threshold for UEPH Building 356 & 358 Living Unit only (threshold for Interior corridor door).

5-4.9.5.8 **Weatherstripping.** ANSI/BHMA A156.22. Provide at all exterior doors.

5-4.9.5.9 **Kick Plates.** ANSI/BHMA A156.6; stainless steel, 254 mm [10"]high x 51 mm [2"] less than door width. Provide at push side of all doors with closers.

5-4.9.5.10 **Locks and keys.** Lock cylinders shall have six pin tumblers and interchangeable cores, which are removable by a control key. Provide a master keying system. Locks for each organizational unit, including exterior storage shall be keyed alike. Contractor shall obtain the key biting report from the hardware manufacturer and provide the report to DPW at the end of the project. Locks and keys shall conform to the standards and requirements of the Builders Hardware Manufacturers Association (BHMA) listed above.

5-4.10 **Exterior Windows.** Provide Historic windows as indicated on the concept design drawings. Refer to concept design drawings for window types and details. Fully glazed windows shall comply with wind load requirements of applicable codes. All sleeping rooms shall have operable windows complying with egress requirements of applicable codes. Windows shall be operable and shall have locks.

5-4.10.1 **Screens.** Fiberglass screens shall be provided at all operable windows and be of window manufacturer's standard design. Fiberglass insect screens, 18 x 16 mesh size, shall be provided for all windows and sliding glass doors and should be the window or door manufacturers standard design for use with the windows and doors being provided. Insect screen frames shall be removable type for easy cleaning.

5-4.10.2 **Exterior Glass and Glazing.** To comply with force protection minimum standards: Single glazing and the inner pane of insulated glass assemblies in exterior windows and doors shall be minimum 6 mm (1/4-inch) annealed laminated glass.

5-4.11 **Insulation.** Insulation shall be provided to meet the following requirements:

5-4.11.1 Thermal and sound insulation shall have a flame spread rating of 25 or less and a smoke development rating of 50 or less exclusive of the vapor barrier when tested in accordance with ASTM E 84. A vapor barrier shall be provided on the warm side of exterior and ceiling insulation for thermal insulation.

5-4.11.2 Urethane is not allowed as an insulation material.

5-4.11.3 Polycyene expanding foam insulation will be permitted as a material to insulate ceilings and walls.

5-4.11.3 **Thermal Insulation.** Provide exterior wall, floor, and roof/ceiling assemblies with thermal transmittance (U-values) required to comply with the proposed energy calculations for the facilities. Insulation shall not be installed directly on top of suspended acoustical panel ceilings.

5-4.12 **Louvers:** Aluminum-framed louvered panels. Louver finish shall be Kynar 500 or approved equal. Kynar 500 properties: a fluoropolymer-polyvinylidene fluoride (PVDF). Finish shall be factory applied and oven baked. Total overall dry film thickness shall be 0.025mm (1mil) thick.

5-4.13 **Exterior Railings.** All exterior handrails and guardrails shall be replaced. Existing railing design does not conform to original historic design for Quad C. Design of exterior handrails and guardrails shall conform to historic character of Quad C. The design shall be coordinated with the State Historical Preservation Office. Exterior railing materials, including bolts and fasteners shall be painted hot-dipped galvanized steel. Design shall comply with all applicable codes. Final handrail design shall be approved by DPW.

## 5-5 INTERIOR DESIGN.

### 5-5.1 Floors and Flooring Material

5-5.1.1 **Floors.** Comply with requirements of applicable codes. Non-combustible construction is preferable, even where combustible materials are allowed by code. Floor finish materials shall be as specified in functional and area requirements listed in Chapter 2 of the Statement of Work.

5-5.1.2 **Quarry Tile.** will be the abrasive surface type as stated in the Tile Council of American Standard 137.1 (Ceramic Tile). Epoxy coatings, linoleum, vinyl and VCT are not acceptable substitutes for quarry tile. Grouting material for quarry tile shall be a grout system employing epoxy resin and hardener portions especially formulated for commercial installations where chemical resistance is important. All grout joints shall be sealed.

5-5.1.3 **Ceramic Tile.** Comply with ANSI A 137.1 and the recommendations of Tile Council of America (TCA) Handbook For Ceramic Tile Installation. Provide marble threshold under doors where a ceramic tile floor meets a different floor finish. All grout joints shall be sealed.

5-5.1.4 **Vinyl Composition Tile.** Vinyl composition tile shall conform to ASTM F 1066, Class 2, through pattern tile, Composition 1, asbestos-free, and shall be 12 inches square and 1/8 inch thick. The tile shall have the color and pattern uniformly distributed throughout the thickness of the tile. Flooring in any one continuous area shall be from the same lot and shall have the same shade and pattern.

5-5.1.5 **Resilient Base.** Base shall be manufacturers standard rubber, coved style (installed with resilient flooring). Base shall be 4 inches high and a minimum 1/8-inch thick. Job formed corners shall be provided.

5-5.1.6 **Carpet.** Carpet construction shall be woven; Type: Broadloom 3.6m minimum usable carpet width; Pile Type: Level Loop; Pile Fiber: Commercial 100% branded federally registered trademark nylon continuous filament; Pile Height: minimum 3.4mm in accordance with ASTM D418; Yarn Pile: minimum 2; Pile density: minimum 4696; Dye method: solution dyed; backing material: backing material shall be 100% synthetic material. Static control shall be provided to control static buildup to less than 3.5 kV when tested at 20% RH and 21 degrees C in accordance with AATCC TM 134.

5-5.1.7 **Concrete Floors:** All concrete floors on the first floor of all Quad C Buildings that will receive vinyl composition tile or carpet shall be provided with hardener/sealer that conforms to the following requirements:

5-5.1.7.1 **Qualifications:** the installer of hardener/sealer shall be certified and shall be on a list of preapproved applicators of the product.

5-5.1.7.2 **Technical Representative:** Hardener/sealer manufacturer's Technical Representative shall be made available for initial training of applicators and field observation during installation of the hardener/sealer. Technical Representative shall certify installations for warranty.

5-5.1.7.3 **Warranty:** Hardener/sealer manufacturer's "Full System 10 year warranty" on the replacement of all flooring material and labor that delaminates due to moisture migration, excessive vapor emissions or contaminates, shall be provided on all concrete floors to receive carpet and resilient flooring.

5-5.2 **Interior Walls and Partitions.** Comply with requirements of applicable codes. Non-combustible construction is preferable, even where combustible materials are allowed by code. The use of 16 mm [5/8"] Type X gypsum board shall be utilized where drywall partition is required.

5-5.2.1 **Offices and Administration areas** are to have full height drywall on metal stud partitions with sound insulation. The use of 16 mm [5/8"] Type X gypsum board shall be utilized where drywall partition is required.

5-5.2.2 **Interior walls:** Masonry or concrete walls at Arms Room, Heavy storage areas for the Company Operation Facilities (COF) shall have full height masonry or concrete walls.

5-5.2.3 **Arms Vault** needs to meet requirements at AR 190-11, Physical Security of Arms, Ammunition, and Explosives. Additional Arms Vault requirements are explained in SOW Ch 5, paragraph 5-7.2 and SOW Ch 6, paragraph 6.5-4

5-5.2.4 **Interior seismic walls:** these walls will be made of concrete. The wall finish shall be smooth; no visible snap-ties or formwork is permitted. These walls will be furred with 64 mm [2-1/2"] metal studs and gypsum board.

5-5.2.5 **Metal Support Systems.** Non-load bearing metal studs and furring shall comply with ASTM C 645; stud gauge shall be as required by height and loading, but shall not be less than 25 gauge. Maximum stud spacing: 406 mm [16"] on center. Provide galvanized finish.

5-5.2.6 **Gypsum Board.** Comply with ASTM C 36. Minimum panel thickness: 16 mm [5/8"]. Provide Type X panels in fire-rated assemblies. Provide moisture resistant panels at locations subject to moisture. Provide abuse-resistant panels where indicated in functional and area requirements. Joint treatment: ASTM C 475. Screws ASTM C 646. Drywall installation: ASTM C 840.

5-5.2.7 **Ceramic Tile:** Comply with ANSI A 137.1 and the recommendations of Tile Council of America (TCA) Handbook For Ceramic Tile Installation. Substrate for wall tile shall be cement backer board (gypsum board is not acceptable).

5-5.2.8 **Concrete seismic wall on existing concrete wall:** these conditions occur at the exterior facing concrete walls. The finish surface shall be smooth for paint application.

### 5-5.3 **Telecommunication Room (Tele)**

5-5.3.1 Require coordination with Schofield Barracks Physical Security Office, Harold Evans, and the Directorate of Information Management, Marion Robinson.

5-5.3.2 Telecomm. rooms which may house SIPR servers shall be treated as classified open storage areas.

5-5.3.3 Security for Telecomm rooms shall be per AR 380-19 information systems security.

5-5.4 **Ceilings.** Non-combustible construction is preferable, even where combustible materials are allowed by code. Ceiling finish materials shall be as specified in functional and area requirements listed in Chapter 2 of the Statement of Work, as indicated on the Concept Design Drawings, and comply with requirements of applicable codes. Textured ceiling finish may be provided in areas other than laundry or bathrooms. Interior finish on walls and ceilings shall be in accordance with NFPA 101. Provide access doors to maintain and service equipment above the ceiling.

5-5.4.1 **Acoustic Ceiling Tile.** Acoustic tile shall be smooth, nondirectional finish on scratch-resistance surface. Acoustic tile shall be washable, humidity resistant, and soil resistant. Provide acoustic tile complying with Class A: Flame Spread 25 or under (UL Labeled) per ASTM E 1264; NRC: 0.70 minimum; CAC: 35 minimum; Light Reflect Coefficient: 0.89 minimum.

5-5.4.2 **Fiberglass Ceiling Tile.** Fiberglass ceiling tile (frp) shall be easy-to-clean panel and made of fiberglass reinforced plastic. Panel surface allows dirt and grease to be cleaned off quickly and easily. As a frp panel it is extremely resistant to most stains and chemicals. The entire panel is moisture resistant and does not support mold or mildew, and it will not rust or corrode. Provided fiberglass tile complying with Class A: Flame Spread 25 or under (UL Labeled) per ASTM E 1264. Light Reflect Coefficient: 0.89 minimum.

5-5.5 **Interior Doors and Frames.** Provide hollow metal doors, or flush wood solid core doors at UEPH and administration spaces. Provide hollow metal doors at COF supply spaces. All frames shall be hollow metal. Hollow metal doors and frames shall have a minimum A60 galvanizing. Hollow metal frames shall have a minimum of 3 wall anchors and one floor anchor per jamb.

5-5.5.1 **Wood Doors.** Provide flush wood solid core doors complying with National Wood Window and Door Association (NWWDA) I.S.-1A. Stile edges shall be non-finger jointed hardwood compatible with face veneer. Provide American Woodwork Institute (AWI) Grade A hardwood face veneer for transparent finished

doors; provide AWI Sound Grade hardwood face veneer for painted doors. Transparent finished doors are preferred.

5-5.5.2 **Hollow Metal Doors.** Comply with ANSI A250.8/SDI 100. Doors shall be Level 2, physical performance Level B, Model 2; top edge closed flush, factory primed. Anchors and accessories shall be zinc coated.

5-5.5.3 **Hollow Metal Frames.** Comply with ANSI A250.8/SDI 100. Frames shall be Level 2, 16 gauge, with continuously welded corners and seamless face joints; factory primed. Anchors and accessories shall be zinc coated. Frames in masonry shall have bituminous back-coating, plaster guards, and shall be grouted solid. All hollow metal doors frames shall be painted (typical).

5-5.5.4 Arms Vault doors and frames needs to meet opening requirements at AR 190-11, Physical Security of Arms, Ammunition, and Explosives. Additional Arms Vault Door and Frame requirements are explained in SOW Ch 5, paragraph 5-7.2 .

5-5.5.5 Telecom Room doors and frames to meet opening requirements for Secret-rated work.

5-5.5.6 **Fire-rated and Smoke Control Doors and Frames.** Comply with International Building Code (IBC), NFPA 80, and requirements of labeling authority. Doors and frames shall bear labels from Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM) or War. Comply with positive pressure testing requirements of IBC.

#### 5-5.6 **Interior Door Finish Hardware.**

5-5.6.1 **Hinges.** ANSI/BHMA A156.1; template, full mortise; Grade 1, ball bearing on doors with closers; Grade 2, bearing on doors without closers. Minimum 114 mm x 114 mm [4 ½" x 4 ½"], stainless steel metal.

5-5.6.2 **Locksets for Typical Interior Door.** Provide stand-alone programmable electronic door locksets with audit capabilities. The lockset construction shall be all-metal, heavy-duty, and mortise. The lockset is equipped with hidden mechanical key override, an anti-pick latch and dead bolt, and a magnetic stripe reader complying with ISO standards and ABA dimensional specifications. Each magnetic stripe card will be programmed to gain access into its respective module and sleeping/living rooms. Lockset shall be similar to Kaba Ilco, Solitaire 710-II Series or approved equal. The lockset shall include knob and lever torque test and "Ultra" finish with two-year warranty ANSI/BHMA A156.13; mortise lockset with removable core; non-ferrous base metal.

5-5.6.3 **Locksets for Typical Interior Utility and Maintenance Doors.** spaces with doors covered by this paragraph include: Mechanical Rooms, Electrical Rooms, Telecommunication Rooms, Communication Rooms, Toilets, Janitor and Stairwell. ANSI/BHMA A156.2; series 4000, Grade 1, non-ferrous base metal, removable core.

5-5.6.4 **Exit (Panic) Devices.** ANSI/BHMA 156.3; heavy-duty touch-pad type, through-bolted mounting. Listed and labeled for panic protection based on UL 305. Doors shall be provided with exit device if required by code.

5-5.6.5 **Closers.** ANSI/BHMA A156.4; series C02000, Grade 1, hydraulic, factory-sized, adjustable to meet field conditions. Provide for all entry doors to living units, all doors opening to corridors and as required by codes.

5-5.6.6 **Auxiliary Hardware.** ANSI/BHMA A156.16. Provide wall or floor stops for all doors that do not have overhead holder/stops. Provide other hardware as necessary for a complete installation.



5-5.6.7 **Kick Plates.** ANSI/BHMA A156.6; stainless steel, 254 mm [10"]high x 51 mm [2"] less than door width. Provide at push side of all doors with closers.

5-5.7 **Fireproofing Roof Structure.** The exposed metal roof truss and metal roof deck shall be fireproofed for one-hour protection. The fire resistive coating shall be elastomeric type. The fireproof material shall be capable of receiving a material finish like paint for example.

5-5.8 **Casework.**

5-5.8.1 Service Areas in Living Units and Coffee Areas in Admin Areas.  
Bathroom Vanity in Living Units  
UEPH Building CQ Station Reception Desk  
Vanity at Public Toilets

The following typical casework description shall apply to the spaces described above:

Provide architectural cabinetwork complying with AWI Quality Standards, Section 400, Custom Grade cabinets with high-pressure decorative laminate finish, meeting NEMA LD3 standards. Horizontal laminate: nominal .050" thick; vertical laminate: nominal .028" thick. Door and drawer edges shall be plastic laminate: nominal .028" thick. Countertop shall be post-formed high-pressure decorative laminate with waterfall front edge and integral coved backsplash, or solid surfacing material. Cabinets shall be constructed as specified and shall meet requirements of KCMA A161.1. The use of any particle board material for cabinet construction is not permitted.

5-5.8.2 **Other casework.** Provide architectural casework complying with AWI Section 400, Custom Grade cabinets with high-pressure decorative laminate finish meeting NEMA LD3 standards. Horizontal laminate: nominal 1.27mm [.050"] thick; vertical laminate: nominal 0.71mm [.028"] thick. Door and drawer edges shall be plastic laminate: nominal 0.71mm [.028"] thick. Work surfaces and counter shall be high-pressure decorative laminate, or solid surfacing material.

5-5.9 **Window Treatments.** Provide horizontal aluminum mini-blinds at all exterior windows. Blinds shall have one-inch wide by .008-inch thick slats with anti-static, anti-microbial polyester baked enamel finish. Provide heavy duty 25mm x 38mm [1" x 1-1/2"] steel headrail, and tubular steel bottom rail finished to match slats.

5-5.10 **Toilet Partitions.** Toilet partition panels shall be floor supported and reinforced to receive partition-mounted accessories. Finish shall be laminated plastic on solid phenolic core. Toilet partition hardware shall be stainless steel. Latching devices, pulls, and hinges for handicap compartments shall comply with Title III of the American Disability Act and Accessibility Guidelines.

5-5.11 **Elevators.** The offeror shall provide the services of an elevator inspector employed by an independent testing company to inspect the elevator, witness the final testing, and certify elevator. The inspector shall meet all qualification requirements of ASME QEI-1 and shall be certified in accordance with ASME QEI-1. The offeror shall provide an elevator certificate signed by the inspector for each elevator. The certificate shall be provided to the Contracting Officer within 30 days of the completion of testing.

5-5.12 **Sound Attenuation.**

5-5.12.1 **Testing.** Certified proof-of-performance field tests will be conducted to demonstrate that the floor and wall systems as constructed provide the required sound isolation. Tests for air-borne sound shall be made in compliance with ASTM E336. Tests for impact sound shall be made in compliance with ASTM E1007. Testing of 10 percent (minimum) of each type of floor and wall system is required. Location of test sites will be chosen at random by the Contracting Officer.

5-5.12.2 Any wall or floor system found to be inadequate shall have the deficiencies corrected and the

additional qualifying tests conducted at the contractor's expense. Testing at the contractor's expense of greater than 10 percent of each system may be required if the Contracting Officer determines that the quality of construction requires this additional testing.

5-5.12.3 Party walls (floor/ceiling construction between different organizational units) shall be designed to provide the minimum airborne sound transmission ratings and impact isolation ratings stated in Table 5-5.12

**TABLE 5-5.12 - SOUND TRANSMISSION STANDARDS  
FOR PARTY WALL CONSTRUCTION**

Area	FSTC <sup>1</sup>	FIIC <sup>2</sup>
Party Walls at UEPH Bldgs. 356 and 358 at all Other Locations	52	N/A
Party Walls at UEPH Bldgs. 356 and 358 Sleeping/Living Rooms.	52	65
Party Walls at Bldg. 355 and 357	52	57
Operable partition at Bldg. 357 Classroom/Classroom	47	N/A

Note<sup>1</sup>: Field Sound Transmission Class. See ASTM E336.

Note<sup>2</sup>: Field Impact Isolation Class. See ASTM E1007.

## **5-6 PAINT FINISHES AND COATING**

5-6.1 Interior surfaces, except factory pre-finished material, shall be painted a minimum of one prime coat and two finish coat. Baths and laundry rooms, and all their painted trim shall be finish painted with semi-gloss latex. Natural finished interior doors are acceptable. All other areas shall be water-based latex low sheen washable eggshell finish for walls/trim and water-based latex low sheen washable eggshell finish for ceilings. Oil-based paint is not allowed except for surfaces that require special coating. Interior paint finish may be textured. When semi-gloss and low sheen painted surfaces are adjacent to each other, the wall surfaces in the room shall be finished with semi-gloss paint to avoid having two different finishes adjacent to each other.

5-6.2 All exterior surfaces including all utility appendages, shall receive a minimum of one prime coat and two finish coats of paint. Exterior paint shall be water-based latex. Exterior low sheen stains (two coats) will be acceptable, where appropriate for wood. Oil-based paint is not allowed except for surfaces that require special coating.

5-6.3 All painting work conform to and be in compliance with Unified Facilities Guide Specifications, Division 09-FINISHES, Section 09900, Paintings and Coatings.

5-6.4 Paints used on surfaces in areas of high humidity where mildew is possible and on fabric or vapor barrier over insulation shall contain a mildewcide. The mildewcide will not adversely affect the color, texture, or durability of the coating. The mildewcide shall be incorporated into the paint by the manufacturer and shall attain a surface disfigurement rating of 8 or greater when tested in accordance with ASTM D 3273 and evaluated in accordance with ASTM D 3274. Mercurial mildewcide and insecticides shall not be used in paints.

5-6.5 Colors shall be as approved from schemes submitted with proposal. All interior paint surfaces shall be painted off-white. Each proposal shall include three basic exterior and interior color coordinated schemes and color samples. Final selection of exterior colors will be made by the Installation Commander (USAGE-HI). Exterior color selections shall conform to the Installation Exterior Architectural Plan (IEAP).

All exterior wood trim to include framing members around garage door openings shall be "back-primed" (surfaces that will be inaccessible to field painting after installation of the wood trim shall be primed with one coat of primer before installation).

## **5-7 PHYSICAL SECURITY REQUIREMENTS.**

**5-7.1 Anti Terrorism / Force Protection.** Designs shall conform to the Department of Defense Minimum Antiterrorism Standards for Buildings, July 31, 2002 listed as Reference 5-2.4. Offerors' proposals will be deemed acceptable provided they comply with the Physical Security Requirements described in paragraphs described below. UEPH buildings are classified as troop billeting structures; COFs, Locker Room Facilities, and Battalion HQs are classified as primary gathering structures

**5-7.1.1** The AT/FP standard used to develop the proposed design is the Department of Defense Minimum Antiterrorism Standards for Buildings, July 31, 2002. Agreements regarding definitions include:

**5-7.1.2** A perimeter barrier (controlled perimeter) is provided for this project.

**5-7.1.3** Minimum Construction Standards based on conventional construction without analysis shall be provided. All minimum standoffs shall be provided according to the Standard.

**5-7.1.4** The structure shall have a 33-foot exclusive clear zone.

**5-7.1.5** Access to parking within 82 feet of Quad C Buildings will be controlled; defined in UFC 4-010-01, para. B-1.1.2.2.1. Parking along roadways within 82 feet of the buildings will not be allowed, defined in UFC 4-010-01, para. B-1.1.2.2.2.

**5-7.1.6** UFC 4-010-01 The preferred location of electrical and mechanical equipment such as transformers, air-cooled condensers, and packaged chillers is outside the unobstructed space or on the roof. However, electrical and mechanical equipment is allowed within the unobstructed space as long as the equipment provides no opportunity for concealment of explosive devices, defined in para. B-1.3.1.

**5-7.1.7** The Quad C structures shall be designed to resist progressive collapse since it is 3 stories in height. Progressive Collapse Vulnerability Assessment is attached to this RFP document for offerors' use.

**5-7.1.8** Laminated 1/4 inch thick annealed glass is required for all exterior windows and doors, defined in para. B-3.1.1. Window frames shall be provided as defined in para. B-3.1.2.

**5-7.1.9** Exterior doors that are not designated as Historic Type (See concept design drawings) are required to be hollow metal door type.

**5-7.1.10** A Mass Notification Alert System is required for this project, defined in para. B-4.7

**5-7.2 Arms Vault at Company Operations Facilities.** Physical Security of Arms shall be in compliance with AR 190-11. Refer to SOW Ch 6, para. 6.5.4 for structural Arms Vault requirements. Refer to SOW Ch 2, para. 2-2.2.2 for Arms Vault in Building 355. New floors, walls, and ceilings shall be provided for each Arms Vault. Unless more stringent construction features are required by life safety or building codes, minimum construction requirements shall be as follows:

**5-7.2.1 Floor.** 152 mm [6"] slab on grade; reinforced with minimum 152 mm x 152 mm MW 25.8 x MW 25.8 [6 x 6, W2.4 x W2.4] welded wire fabric, on vapor barrier, on 152 mm [6"] deep porous fill.

**5-7.2.2 Walls.** 206 mm [8"] thick cast-in-place concrete reinforced with 15M [#5] bars at 152 mm [6"]

on center, each way, each face. Concrete masonry units reinforced in a similar manner, as described, will be permitted.

5-7.2.3 **Ceiling.** 206 mm [8"] thick cast-in-place concrete reinforced with 15M [#5] bars at 152 mm [6"] on center, each way, each face.

5-7.2.4 **Door and Frame.** Provide 44mm [1-3/4"] thick hollow metal door, industrial type construction, minimum 14 ga. skin plate thickness, and internally reinforced vertically with continuous steel stiffeners spaced 152mm [6"] max. on center. Provide steel bar type, Dutch door style daygate with metal shelf for issuing arms and ammo. **Daygate shall have lock operated from outside by key, and from inside by handle. Comply with egress requirements of applicable codes.**

5-7.2.5 **Penetrations.** Penetrations shall be minimized. All openings or penetrations in Vault floor, walls or ceiling greater than .062 m<sup>2</sup> [96 square inches] shall be protected with welded steel rod-and-bar grid weighing 39.6 kg/m<sup>2</sup> [8.1 lb./sf], consisting of 25.4 mm x 4.8 mm [1" x 3/16"] vertical bearing bars at 25 mm [1"] on center, and 8 mm [5/16"] diameter horizontal rods at 50 mm [2"] on center; or equivalent protection.

5-7.2.6 **Arms Rack Anchor Rings.** Provide 10 mm [3/8"] diameter stainless steel bar bent into U-shape (25 mm inside radius). Overall length shall be 127 mm [5"]; embed 76 mm [3"] of horizontal legs (open end) in pre-drilled epoxy filled holes. U-shaped end will protrude from floor to provide anchorage for GFGI arms racks. Orient the projecting U-shape vertically. Provide anchor rings at 3'-0" on center along the floor inside the Arms Vault -Verify with DPW for exact installation and mounting location.

5-7.2.7 **Floor Anchors for GFGI Security Safes.** Provide 10 mm [3/8"] diameter stainless steel bar bent into U-shape (25 mm inside radius) with 2" long 90 degree returns at ends of vertical legs. Overall height shall be 127 mm [5"]; embed 76 mm [3"] of vertical legs (open end) in concrete floor slab; 51 mm [2"] of U-shaped end will protrude above slab to provide anchorage for GFGI security safe.

## 5-8 SIGNAGE

5-8.1 **Directional, Informational, and Motivational Signage.** Signs consist of exterior building signage, interior signage, Interior building directories, directional signs, and identification signs. All Exterior and Interior Signage shall comply with TM 5-807-10. Coordinate with installation facilities engineer (DPW) for location of all signs, color of sign, and verbiage to be included on all signs. All exterior signs and interior Building Directory Signs shall be constructed of minimum 0.090-inch thick aluminum sheets. All other signs shall be constructed of minimum 4.76 mm [3/16-inch] thick plastic acrylic sheets. All signage shall comply with requirements of ADAAG and UFAS. Refer to Attachment No. 1 for Sign Types described below.

5-8.2 **Exterior Signs:** provide the following Exterior Building Sign Types:

- 5-8.2.1 Provide a total of four Exterior Building Identification Signs, one per building, Type D4, Sign grid 1, size: 762 mm H x 1067 mm W [30"H x 42"W].
- 5-8.2.2 Provide a total of eight Exterior Building Number Signs, two per building, Type C8, wall mounted, Sign grid 1, size: 457 mm H x 1372 mm W [18"H x 54"W].
- 5-8.2.3 Provide all exterior doors with Room Identification Sign, Type BB2, wall mounted, size: 229 mm H x 229 mm W [9"H x 9"W].
- 5-8.2.4 Provide a total of 12 Exterior Guide Signs, Type AA5, wall mounted, size: 3 modules of 70 mm H x 457 mm [W 2-3/4"H x 18"W].

- 5-8.2.5 Provide a total of 12 Exterior Guide Signs, Type AA6, ceiling mounted, size: 3 modules of 102 mm H x 610 mm W [4"H x 24"W].
- 5-8.2.6 Provide a total of 15 Company Identification Sign, Type BB2 (similar), wall mounted, size: 305 mm H x 610 mm W [12"H x 24"W]. Text Size=1" Cap with ½" line spacing vertically in lieu of 3/8".
- 5-8.3 **Interior Signs:** provide the following Interior Building Sign Types:
  - 5-8.3.1 Provide eight Building Directory Signs, two per building, Type AA1, wall mounted, Sign grid 2, size: 1067 mm H x 1219 mm [42"H x 48"W].
  - 5-8.3.2 Provide all interior doors with Room Identification Sign, Type BB2, wall mounted, size: 229 mm H x 229 mm [9"H x 9"W].
- 5-8.4 See accessibility section for accessible signage requirements.

## **5-9 ACCESSIBILITY FOR HANDICAPPED (PHYSICALLY IMPAIRED) PERSONS, BARRIER FREE DESIGN.**

- 5-9.1 Accessibility will be based on requirements of the Americans with Disabilities Act (ADA.) Public accommodation will be provided as described in the ADA Architectural Guidelines (ADAAG.). Refer to SOW Chapter 2 for ADA requirements for individual spaces.
- 5-9.2 Proposed accommodations generally consist of the following:
  - 5-9.2.1 Public areas will be ADA-compliant.
  - 5-9.2.2 Entries and exits accessible as required by ADA.
  - 5-9.2.3 An accessible path to all offices will be provided.
  - 5-9.2.4 Toilets Rooms to be ADA-compliant.
  - 5-9.2.5 All common use areas will be ADA-compliant.
  - 5-9.2.6 ADA-compliant directional and identification signage will be provided.
  - 5-9.2.7 All employee-only spaces will be provided with ADA-compliant approach, entry, turn-around and exit.
  - 5-9.2.8 Where disabled employees presently exist, provide path and floor area space suitable for accommodation should be provided. No disabled employees have been identified.
  - 5-9.2.9 ADA-compliant fire alarm systems are described in the Fire Protection Design Analysis.
  - 5-9.2.10 ADA-compliant communication systems are described in the Electrical Design Analysis.

## CHAPTER 6

## STRUCTURAL DESIGN

6-1 **GENERAL.** The structural criteria established herein shall be used for structural loading, design and installation of all structural systems and foundations, including manufacturing, erection, supervision, testing, and quality assurance of the completed installation of the buildings. A concept structural design which includes seismic and antiterrorism/force protection design has been prepared by the Government and is an attachment to this RPF. The offerors shall incorporate the concept structural design into their design proposal, however the concept design may be changed due to innovation or economic efficiency, not withstanding requirements of all other sections of this rfp and provided all structural criteria herein are met and accounted for in a rational analysis and stamped by a structural engineer licensed in the U.S. The winning offeror shall provide final structural design in compliance with the structural design criteria listed below.

6-2 **DESIGN CRITERIA.** Structural design criteria and guidance are contained in the following documents. Editions that are current at the date of issue of the RFP shall apply.

- 6-2.1. TI 800-01, Design Criteria
- 6-2.2. TI 809-04, Seismic Design for Buildings
- 6-2.3. TI 809-05, Seismic Evaluation and Rehabilitation for Buildings
- 6-2.4. TM 5-853-1, Security Engineering, Vols 1-3 (For Official Use Only)
- 6-2.5. MIL HNDBK 1013/1A, Design Guidelines for Physical Security of Facilities
- 6-2.6. AR 190-11, Physical Security of Arms, Ammunition, and Explosives, with Change 1
- 6-2.7. ASCE 7, Minimum Design Loads for Buildings and Other Structures
- 6-2.8. Unified Facilities Guide Specifications (UFGS)
- 6-2.9. EM 1110-2-2002, Evaluation and Repair of Concrete Structures
- 6-2.10. UFC 4-010-01, DOD Minimum Antiterrorism Standards for Buildings, 31 Jul, 2002
- 6-2.11. UFC 1-200-01, Design: General Building Requirements, dated 31 July 2003
- 6-2.12. 2000 International Building Code (IBC 2000)

6-3 **MINIMUM LOAD STANDARDS.** Design loads and load combinations shall be in accordance with 2000 IBC, except as otherwise indicated by this chapter. Additional seismic and anti-terrorism requirements are covered under criteria listed in paragraphs that follow. Design loads shall meet the minimum load standards shown in Table 6-1.

TABLE 6-1 - MINIMUM LOAD STANDARDS

<u>LOAD TYPE</u>	<u>REQUIREMENT</u>
Dead Load	Actual
Roof Live Load	1 kPa (20 psf)
Balconies, First Floor Corridor, Stair, Dining & Serving Room	4.8 kPa (100 psf)
Corridor above first floor	3.8 kPa (80 psf)
Dining and Serving Room	4.8 kPa (100 psf)
Kitchen and Dishwashing Room	12 kPa (150 psf)
Residential Live Load	1.9 kPa (40 psf)
Classroom Live Load	1.9 kPa (40 psf)

**SOW 6-1**  
(Am-0002)

Office and Restroom Live Load	2.4 kPa (50 psf)
Light Storage Live Load	3.5 kPa (70 psf)
Stair and Exitways	4.8 kPa (100 psf)
Mechanical and Electrical Room Live Load	7.2 kPa (150 psf)
Wind Load Criteria	105 MPH Basic Wind Speed Exposure "C" in accordance with ASCE 7
Seismic Load Criteria	Refer to Seismic Evaluation and Rehabilitation Report

#### 6-4 MINIMUM MATERIAL STRENGTHS AND PROPERTIES.

6-4.1 **Foundation.** Foundation shall be concrete footings and/or thickened slab edges compatible with the soil and climatic conditions of the site. Allowable soil bearing pressure shall be 3000 psf for footings bearing on undisturbed residual soil.

6-4.2 **Reinforced Concrete.** Concrete Requirements. All concrete shall conform to IBC 2000.

6-4.2.1 Minimum concrete strength at 28 days: 21 Mpa (3000 psi) with water-cement ratio not more than 0.45.

6-4.2.2 Minimum concrete thickness:

Slab-on-grade: Non-structural interior slab-on-grade design shall be in accordance with TI 809-02. Non-structural interior slab-on-grade system shall consist of minimum 102 mm (4") concrete slab over vapor barrier over granular termite barrier over separation geotextile over capillary water barrier. Welded wire reinforcement shall be secured at mid-depth of slab by mechanical means such as precast concrete spacers or reinforcing chairs. All slabs-on-grade shall be moist cured for a minimum of 7 days followed by curing by curing compound for another 3 weeks. Curing compound shall be dissipating type compatible with any floor seal or floor covering adhesive.

Structural members. The thickness of all structural members shall conform to ACI 318, Building Code Requirements for Reinforced Concrete.

6-4.2.3 The minimum yield strength  $F_y$  of reinforcing steel shall be 275 Mpa (40,000 psi).

6-4.3 **Concrete Masonry Units (CMU).**

6-4.3.1 Reinforced masonry assemblies shall have a minimum compressive strength of 10.34 Mpa (1500 psi).

6-4.3.2 Cmu shall conform to ASTM C 90, Type II, except oven-dry weight shall be no less than 581 kg per cubic meter (119 pcf) for hollow load bearing units.

6-4.3.3 Mortar shall be Type "S" conforming to ASTM C 270.

6-4.3.4 Grout shall conform to ASTM C 476 with a minimum compressive strength of 15 Mpa (2000 psi).

**6-4.4 Structural Steel.**

6-4.4.1 Structural steel shall conform to ASTM A 36 or better.

6-4.4.2 Anchor bolts shall conform to ASTM A 307. Machine bolts shall conform to ASTM A 325.

6-4.4.3 All welds shall be accomplished by certified welders in conformance with AWS D1.1, Structural Welding Code.

6-4.4.4 All steel shall be primed in the shop. Exposed steel shall be hot-dip galvanized.

**6-4.5 Light Gage (Cold-Formed) Steel Construction.** Design and construction shall be in accordance with IBC 2000.

6-4.5.1 Fasteners. All screws, bolts, anchor bolts and expansion shields shall be stainless steel or finished with zinc, cadmium or co-polymer coatings. Pneumatically driven pins or nails will not be permitted. All welded connections shall be designed in accordance with Section E of the AISI Specification. All welding shall be accomplished in accordance with AWS D1.3 standards. All weld areas shall be re-touched with the appropriate paint or cold galvanized to retain corrosion resistance.

6-4.5.2 Protective Coating. Exposed light gage steel members will not be allowed. All light gage steel used for exterior applications shall have minimum G-90 hot dip zinc coating in accordance with ASTM A 525. Exterior applications include all steel members directly supporting exterior siding or roof sheathing. Interior applications shall have a minimum G-60 hot dip zinc coating in accordance with ASTM A 525.

**6-4.6 Miscellaneous Metal Items.** All railings, handrails, anchor bolts, plates, and steel embedded in concrete, metal studs and runners, and other miscellaneous metal items shall be galvanized. All damaged galvanized areas not embedded shall be repaired with galvanizing repair compound. All metal items listed above that are exposed to the weather or exterior shall be hot-dip galvanized or coated with inorganic zinc primer.

**6-4.7 Structural Wood.**

6-4.7.1 Wood structural members are not allowed.

**6-5 SPECIAL REQUIREMENTS.**

**6-5.1 AISC Certification requirements:** All fabrication of structural steel shall be accomplished by an AISC certified Category Sbd fabricating plant.

**6-5.2 Materials Testing.** As a minimum, the following concrete tests shall be performed: air content, slump, unit weight, temperature, and strength. Refer to United Facilities Guide Specification Section 03300, Cast-in-Place Structural Concrete, for sampling and testing standards. All costs for testing shall be borne by the Contractor.

**6-5.3 Special Inspection.** Continuous or periodic special inspection by a certified inspector shall be performed on seismic-resisting systems in accordance with IBC 2000, Section 1704. See also Unified Facilities Guide Specification Section 01452, Special Inspection for Seismic-Resisting Systems, for inspection requirements and other details.

**6-5.4 Arms Vaults.** The arms vault in each Company Operations Facility shall meet the requirements



of AR 190-11. Refer also to paragraph 5-7.2.6, "Arms Rack Anchor Rings".

**6-5.5 Antiterrorism/Force Protection (AT/FP).** This project is classified as a major renovation for inhabited structures of troop billeting and primary gathering structures which shall be designed and constructed to meet DOD AT/FP design criteria, UFC 4-010-01, DOD Minimum Antiterrorism Standards for Buildings, 31 Jul, 2002.

The Government has prepared a concept site plan which employs operational options for parking areas and roadways to meet all AT/FP standoff distance requirements of UFC 4-010-01 and to obviate the need to harden the existing Quad C buildings for anti-terrorism blast loads. Refer to Statement of Work, Chapter 3, Paragraph 3-5, Site Development Plan, for AT/FP operational options in the site concept design.

The Government has also prepared an independent anti-terrorism/force protection assessment and retrofit (AT/FP concept design) report, entitled "Progressive Collapse Vulnerability Assessment", by Mitsunaga and Associates, dated May 2003 (attached) to provide compliance to other AT/FP requirements of UFC 4-010-01.

New windows shall meet requirements of UFC 4-010-01, paragraph B-3.1 as indicated by the AT/FP concept design. Window criteria include minimum ¼" nominal laminated glass for all exterior windows and glazed doors with 3/8" minimum frame bite for structural glazed windows and 1" bite for window systems that are not structurally glazed.

The requirement to design and retrofit existing floor slabs (with FRP or similar top slab reinforcing) to withstand upward blast loads as given by paragraph B-2.1.3 of UFC 4-010-01 shall be treated as a bid option to this project since this floor slab requirement is not required in accordance with the interim 1999 AT/FP standards.

The offerors shall incorporate all AT/FP concept design report and the Site Development Plan (paragraph 3-5) into their design proposal submissions and shall include associated retrofit costs in their price proposal submissions. The AT/FP concept design and the Site Development Plan (paragraph 3-5) shall be the basis for final design and actual construction. **Provide work necessary for retrofit but not shown on the on concept design.** The AT/FP concept design retrofit upgrades shall be integrated with the seismic rehabilitation plan described in the following paragraph, so that strengthened/new structural members may serve dual functions. Anti-terrorism/force protection design shall be comply with the statement of work chapters on Historical Preservation.

**6-5.6 Seismic Evaluation and Rehabilitation.** Army regulations require that the buildings of Quad C be evaluated to determine possible requirements for structural rehabilitation to mitigate seismic hazards. The Government has prepared an independent seismic evaluation and rehabilitation (concept seismic design) report to minimize risks to offerors due to unknown conditions. The seismic concept design report entitled, "Seismic Evaluation and Rehabilitation Report, by Mitsunaga and associates, Inc, dated May 2003 is attached to this RFP. The offerors shall incorporate the seismic concept design into their design proposal submissions, and include seismic rehabilitation costs in their price proposal submissions. **Provide work necessary for retrofit but not shown on the on concept design.** To give the offeror the opportunity for design innovation and economy, the design proposal need not follow the concept design exactly, provided the seismic forces specified in the report are accounted for in a rational analysis developed by a licensed structural engineer, and load path requirements are met. **The seismic design criteria for the seismic concept design include TI 809-05, Seismic Evaluation and Rehabilitation for Buildings, and TI 809-04, Seismic Design of Buildings.**

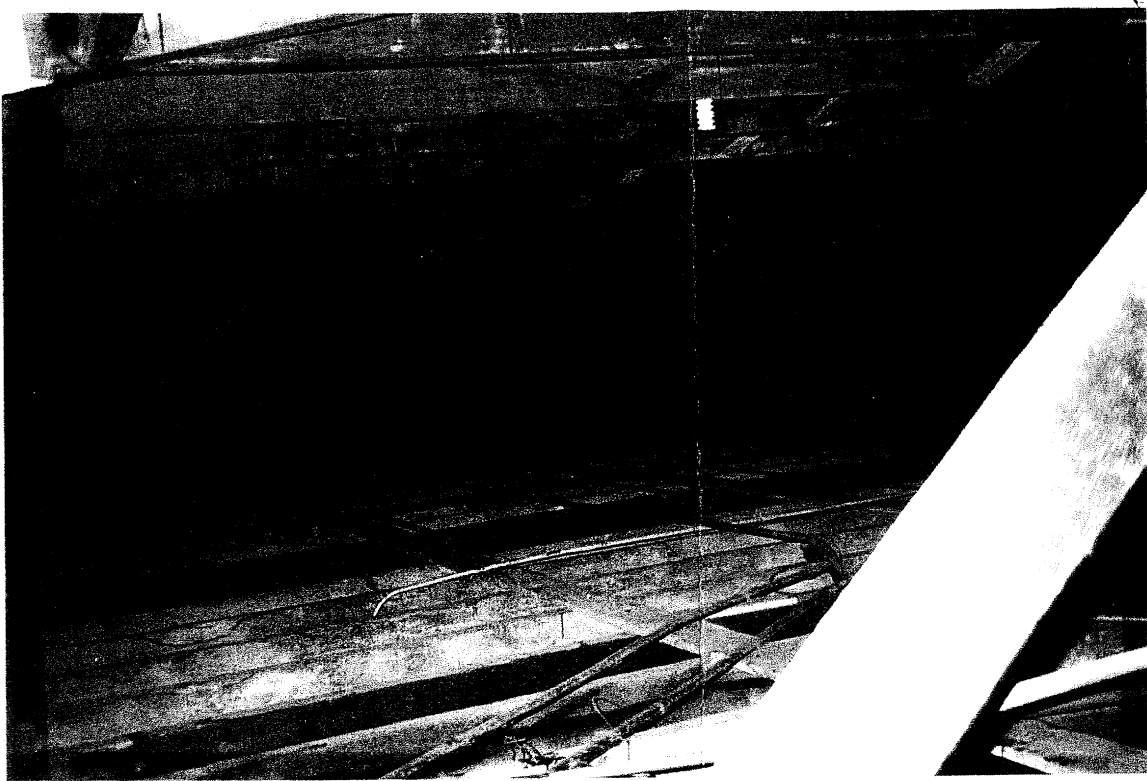
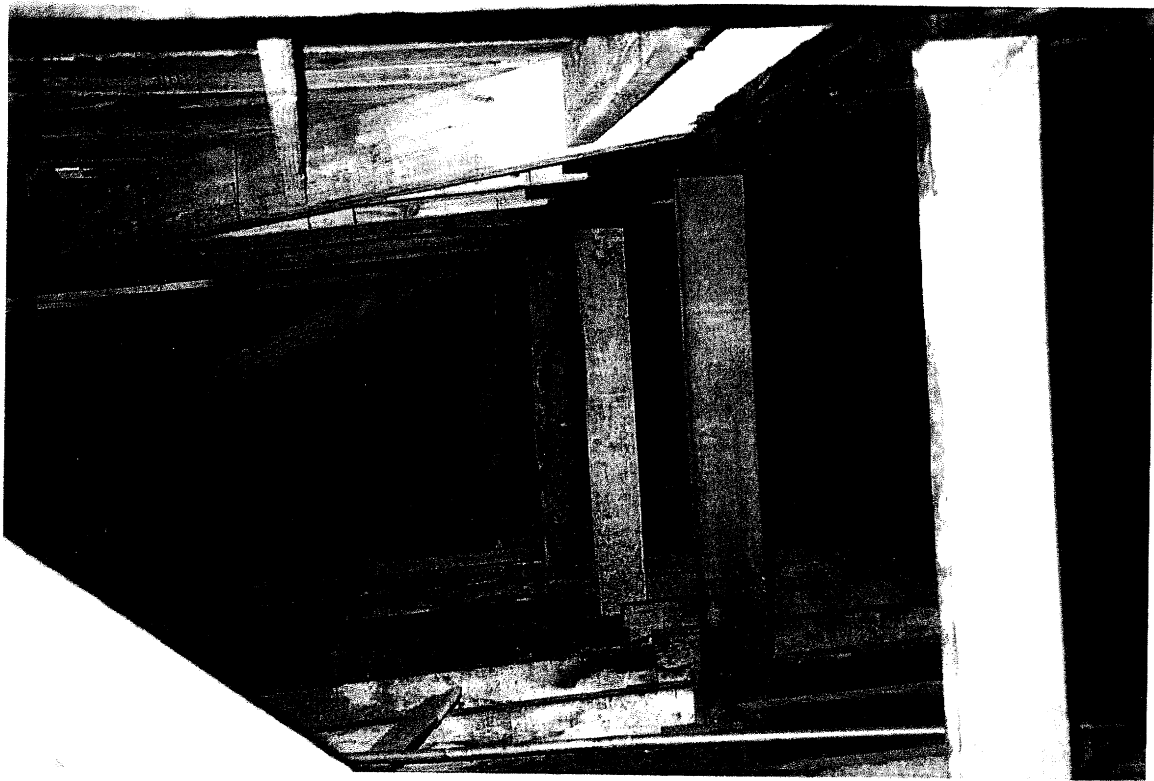
**Requirements for seismic rehabilitation shall be integrated with AT/FP and Historic Preservation requirements.**

6-5.7. **Concrete Damage Repair.** No major concrete repairs are anticipated. Miscellaneous spalling and cracking shall be repaired following methods prescribed in EM 1110-2-2002, Evaluation and Repair of Concrete Structures.

6-5.8 **Existing and New Structural Systems.** Existing structural systems shall be analyzed and retrofitted to insure new live loads provided in IBC 2000 or Table 6-1 can be supported. Provide all work necessary for final design but not shown on concept design. New live loads shall include but not limited to new cooling tower, machine rooms, locker rooms, and arms rooms. Refer to attachment entitled, CONCEPT DESIGN ANALYSIS OF EXISTING STRUCTURAL SYSTEM (DEAD AND LIVE LOADS).

**New footings or enlarged footings shall be provided where required for required building loads (including seismic loads).**

**There are no structural as-built drawings for Quad C. The bidder shall assume that existing structural members are adequate for existing floor loads. The contractor shall strengthen the existing structure where the new floor plan requires increased floor live load over existing floor live load. Where there is an increase in live loads, the contractor shall perform nondestructive and destructive tests as required, after award of the contract, to verify actual existing structural conditions and to verify structural adequacy.**



EXISTING TIMBER ROOF FRAMING  
(SIMILAR TO QUAD C ROOF TRUSS)

## CHAPTER 12

### FIRE PROTECTION

#### 12-1 GENERAL REQUIREMENTS

12-1.1. **Fire Protection scope.** The fire protection requirements for the project, as indicated in this Chapter, are generally contained within this chapter unless otherwise noted. Other fire protection scope indicated by other Chapters and the Attachment Concept Design Documents (Drawings, Fire Protection Analysis), which are to be used for the design of this project, are subject to requirements within this section.

All requirements within this Chapter shall take precedence over any conflicting requirement in other Chapters, Attachment Concept Design Documents or any other criteria and shall be brought to the attention of the Contracting Officer for resolution in writing. All definitions and acronyms used in this section are intended to be used for this section only unless otherwise noted. All installed materials and equipment are in general to be listed by an independent laboratory such as Underwriters Laboratory. Catalog cuts in the attachments are not intended to be exact equipment provided. Equipment shall be similar to catalog cuts and based on design developed after award.

12-1.2. **Design Standards and Codes.** The design of this project shall be in accordance with the design standard and codes stated within this paragraph. The following list is not complete. Other applicable references are to be used when required by other Chapters and other references used within these standards and codes.

- 12-1.2.1. UFC 3-600-01 (UFC), Design Fire Protection Engineering for Facilities, 2003 edition.
- 12-1.2.2. International Building Code (IBC) 2000 edition.
- 12-1.2.3. NFPA 10, Portable Fire Extinguishers, 2002 edition.
- 12-1.2.4. NFPA 13 (FSC), Installation of Sprinkler Systems, 2002 edition.
- 12-1.2.5. NFPA 13R, Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and including Four Stories in Height, 2002
- 12-1.2.6. NFPA 17A, Wet Chemical Extinguishing Systems, 2002.
- 12-1.2.7. NFPA 20, Stationary Pumps for Fire Protection, 1999.
- 12-1.2.8. NFPA 24, Private Fire Service Mains, 2002 edition.
- 12-1.2.9. NFPA 30, Flammable and Combustible Liquids Code, 2000 edition.
- 12-1.2.10. NFPA 70, National Electrical Code, 2002.
- 12-1.2.11. NFPA 72 (FAC), National Fire Alarm Code, 2002 edition.
- 12-1.2.12. NFPA 75, Electronic Computer/Data Processing Equipment, 2003.
- 12-1.2.13. NFPA 80, Fire Doors and Fire Windows, 1999.
- 12-1.2.14. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems, 2002.
- 12-1.2.15. NFPA 96, Ventilation Control and Fire Protection of Commercial Cooking Operations, 2001 edition.

- 12-1.2.16. NFPA 101 (LSC), Safety to Life from Fire in Buildings and Structures, 2003 edition.
- 12-1.2.17. ER 1110-345-700, Engineering and Design Analysis, Drawings and Specifications, 30 May 1997.
- 12-1.2.18. ADA Accessibility Guidelines for Buildings and Facilities (ADAAG).
- 12-1.2.19. MIL-HDBK-1022A (1022), Petroleum Fuel Facilities, 01 November 1999.
- 12-1.2.20. UL Fire Protection Equipment Directory (ULFPED), 2002 edition.
- 12-1.2.21. UL Building Materials Directory (ULBMD), 2002 edition.
- 12-1.2.22. UL Fire Resistance Directory (ULFRD), 2001 edition.
- 12-1.2.23. TI 800-01, Technical Instructions Design Criteria, 20 Jul 98.
- 12-1.2.24. Unified Facilities Guide Specification (UFGS).
- 12-1.2.24.1. Section 7840a, Firestopping, April 2003.
- 12-1.2.24.2. Section 13920A, Fire Pumps, December 2001.
- 12-1.2.24.3. Section 13930A, Wet Pipe Sprinkler System, Fire Protection, March 2003.
- 12-1.2.24.4. Section 13945A, Preaction and Deluge Systems, Fire Protection, March 2003.
- 12-1.2.24.5. Section 13851A, Fire Detection and Alarm System Addressable, February 2002.

**12-2 APPENDIX AND RECOMMENDATIONS.** Fire protection criteria in general that are stated in any reference, which are either in the appendix, stated as a recommendation or addressed with a "should" shall be considered to be mandatory requirements and will be incorporated into the design.

### **12-3 DEFINITIONS**

12-3.1. **General.** Definitions as indicated in LSC shall be used unless otherwise noted.

12-3.2. **Fire Protection Work.** All construction materials and installation necessary to install complete fire alarm systems, automatic fire sprinkler systems, fire rated partitions, fire rated doors & hardware, fire rated windows & hardware, firestopping, fire rated construction, exit signs, automatic fan shutdown, all means of egress and any other work as designated by the DAHJ.

**12-4 AUTHORITY HAVING JURISDICTION (AHJ):** The AHJ is HQUSACE, CEMP-ET, Mr Robert Diangelo. The District Authority Having Jurisdiction (DAHJ) is the Honolulu Engineer District Fire Protection Engineer, CEPOH-EC-Q and will be consulted for all interpretations of fire protection criteria to be used in this project through the Contracting Officer or his representative. Contractor shall not contact the AHJ and shall direct all questions, interpretations and clarifications to the DAHJ. All requests for information by the Contractor shall be submitted to the DAHJ in writing through the Contracting Officer with the appropriate sketches, basis for waiver, specific question and any other information deemed necessary by the DAHJ. In general, a minimum of 7 calendar days is required by the DAHJ to respond to all inquiries. The 7 days will start from the day of receipt by the DAHJ. In the event interpretation or approval is required from AHJ, an additional 7 calendar days will normally be required.

**12-5 WAIVER TO CRITERIA.** All waivers to be processed in accordance with UFC shall be

forwarded to the DAHJ for preliminary assessment. Waivers are to be forwarded to AHJ for approval if deemed necessary by DAHJ.

**12-6 PRIORITY OF CONFLICTING REQUIREMENTS.** In general, Contractor to use UFC & UFGS as the main document for fire protection criteria and these documents shall take precedence over any other document in accordance with UFC. ETL's and specific code requirement will supercede general requirements found in UFC, otherwise the most restrictive requirement shall be provided. DAHJ shall be consulted on all conflicting requirements and reserves the right to make final determination or by coordinating with the AHJ if deemed necessary. Conflicting requirements of Life Safety and historical preservation shall be brought to the attention of the Contracting Officer in writing and resolved by the DAHJ and historical preservation officer.

**12-7 FIRE PROTECTION ENGINEER SERVICES.** Contractor shall hire a qualified Fire Protection Engineer licensed as a Professional Engineer to consult, design, inspect and prepare design drawings, specifications, calculations and supervise construction as necessary. Qualifications must be submitted in writing to the Contracting Officer for approval. Any other licensed professional engineer or architect, who is a current Member status of the Society of Fire Protection Engineers with qualifying experience can act as the Fire Protection Engineer. Approval through the Contracting Officer, in writing, by the DAHJ is required prior to commencement of the building design.

#### **12-8 IBC REQUIREMENTS**

**12-8.1. Allowable area and allowable height.** Design analysis shall confirm the allowable construction type and allowable area/height in accordance with IBC by calculating the allowable areas and submitting them in the design analysis. Any type of construction allowed by the IBC will be allowed on this project as long as IBC allowable area and height restrictions are provided.

**12-8.2. Location on property.** Design analysis shall show the exterior wall/opening protection required in accordance with IBC.

**12-8.3. Occupancy Separation walls.** IBC occupancy separation walls are required to be installed throughout the building in addition to the Protection from Hazards separation walls required in LSC.

#### **12-9 LIFE SAFETY REQUIREMENTS**

**12-9.1. General.** LSC with UFC amending portions of LSC are to be provided.

**12-9.2. Stairs.** All required stairs shall be protected in accordance with LSC.

**12-9.3. Magnetic Card Locks.** Use of magnetic card type locks shall meet LSC for egress.

**12-9.4. Firefighter Access.** Firefighter access shall be provided in accordance with UFC.

**12-9.5. Fire Rated Shafts.** Use of fire rated shafts shall be minimized on all buildings. All pipe risers shall be separated from the duct risers and be firestopped at the floors. All duct risers, which penetrate more than 1 floor shall be enclosed in a 1 hr fire rated shaft. Use of subducts are prohibited. Fire dampers shall be listed with ULBMD or FM and conform to Chapter 10 – HVAC.

**12-9.6. Interior Finishes.** Interior finishes shall be provided in accordance with LSC.

**12-9.7. Exit Signs.** Internally illuminated signs using Light emitting diode (LED) type shall be used.

**12-9.8. Portable fire extinguishers.** Provide portable fire extinguishers in semi-recessed cabinets throughout the building in accordance with NFPA 10 and shall be listed with ULFPE or FM.

12-9.9. **Fire rated assemblies.** Fire rated doors/door frames and windows (glazing and window frame) shall be listed by ULBMD or FM and shall be installed in accordance with the door/window manufacturer and NFPA 80.

12-9.10. **Fire rated construction.** All fire rated walls, floors, ceilings, floor/ceilings, roof/ceilings shall meet ULFRD or FM.

12-9.11. **Firestopping.** All penetrations of fire rated walls by ducts, pipe or conduit must be protected with listed firestopping and installed in accordance with the manufacturer's listed installation instructions. Listed installation instructions shall be submitted for approval to the Contracting Officer prior to installation. Firestopping shall be listed with ULFRD or FM.

12-9.11.1 Firestopping ID plate: A permanent wall identification plate (WID) and a pipe tag are required to be permanently mounted adjacent to every fire barrier penetration on both sides of the wall or floor. The WID plate shall be minimum 4" X 3" (102mm X 77 mm) in size and the pipe tag shall be minimum 1.5" X 1.5" (38mm X 38mm) in size, have raised letters & constructed of 20 gage minimum corrosion proof metal. In the event there are multiple pipe penetrations with the same firestopping system, a single wall ID plate can be used if each pipe penetration is listed on the WID plate separated with commas and each pipe is identified with a pipe tag. Information on the WID must be clearly readable from a minimum of 5 feet (1524 mm) Shop drawings to be submitted for approval. All WID and pipe tags to be submitted for approval prior to installation.

The wall ID plate shall contain the following:

\_\_\_\_hr Fire Barrier Penetration  
 Pipe # \_\_\_\_\_  
 UL System # \_\_\_\_\_  
 Description: \_\_\_\_\_  
 \_\_\_\_\_  
 F rating: \_\_\_\_\_ hr  
 T rating: \_\_\_\_\_ hr  
 Wall/Floor Material: \_\_\_\_\_  
 Sealant ID \_\_\_\_\_  
 Manufacturer \_\_\_\_\_  
 Certified Installer:  
 Name: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 \_\_\_\_\_  
 Installation Date: \_\_\_\_\_

Example:

1 hr Fire Barrier Penetration  
 Pipe # 1, 2, 5  
 UL System # WL2078  
 Description: Plastic pipe thru 1 hr  
gypsum wall  
 F rating: 1 hr  
 T rating: 1 hr  
 Wall/Floor Material: Gypsum wall  
 Sealant ID: Hilti CP 642  
 Manufacturer Hilti  
 Certified Installer:  
 Name: Mr Chester Yamamoto

Company: Firestopping Inc.  
Address: 1920 Ala Moana Blvd  
Honolulu, HI 96818  
Installation Date: 30 June 2003

The pipe tag shall contain the following:

Pipe # \_\_\_\_\_  
Insulated: \_\_\_\_\_  
Pipe Material: \_\_\_\_\_  
Pipe Size: \_\_\_\_\_  
Use: \_\_\_\_\_

Example:

Pipe # 5  
Insulated: No  
Pipe Material: CPVC  
Pipe Size: 4"  
Use: domestic CW

## 12-10 FIRE SPRINKLER AND FIRE PUMP REQUIREMENTS

12-10.1. **General.** All the buildings shall be provided with new wet pipe sprinkler system meeting FSC, FSCR, UFC and UFGS 13930. Sprinkler flow switches, pressure switches and tamper switches are to be connected to the building fire alarm panel.

12-10.2. **Design area and density.** Area/density method in accordance with the UFC shall be used. Hydrant flows shall be added to all hydraulic sprinkler calculations as indicated in UFC. Available water supply must provide the fire demand equivalent to the sum of sprinkler demand + hose stream(s) demand + domestic demand. Hydrant flow test shall be performed by Contractor to obtain available water supply capacity. Hydraulic calculations are to be performed using approved computer software. Minimum design hydrant pressure shall be 20 psig at full fire demand.

12-10.3. **Fire pump.** Listed engine driven fire pumps shall be provided in a building as indicated in accordance with UFC. Water storage tanks shall be provided in the event the available water supply flow capacity is exceeded and shall meet NFPA 22. Water tank capacity shall meet UFC. Fire Pump controller shall be NEMA type 4X. Fire Pump shall meet requirements in UFGS 13920A. Fire Pump Building shall be located 50 feet minimum from Quad C buildings (follow NFPA 20) and as indicated.

12-10.4. **Fire sprinklers.** Quick response sprinkler shall be used as a minimum in all Light Hazard occupancy areas throughout the building in accordance with FSC. Decrease in design area allowed by FSC for use with quick response sprinkler heads will be allowed.

12-10.5. **Fire Department Connections.** Fire department connections must be within 150 feet of hydrant.

12-10.6. **Backflow Preventers.** Double check type backflow preventers are required on all sprinkler system connections to the potable water supply, which are listed for fire service by an independent testing agency such as UL.

12-10.7. **Sprinkler flow farther than 10 feet from building.** All valves controlling sprinkler water flow farther than 10 feet from building shall be chain and locked open and all the valves 10 feet or closer to the



building shall be supervised with a weather resistant tamper switch connected to the fire alarm panel supervisory alarm circuit.

12-10.8. **Seismic requirements.** Seismic earthquake requirements in FSC are required.

12-10.9. **Plastic piping.** Plastic piping/fittings are not allowed.

12-10.10 **T drill fittings.** "T drill" method are not allowed.

12-10.10. **Post Indicator Valve.** Post indicator valve (PIV) is required on all sprinkler system supplies, NFPA 24. Elimination of the PIV will be allowed if the backflow preventer/shutoff valve assembly is located in the same location as the PIV, according to NFPA 24. Backflow preventer isolation valves to be indicating type with supervision.

12-10.11. **Hydrant flow test data.** Contractor shall use attached flow data and calculations for bidding purposes. The successful contractor shall perform a hydrant flow test to validate the project design after award. The hydrant flow test shall be performed in accordance with NFPA 291 and with the Schofield Barracks Water Treatment Plant clearwell pumps off. Flow data shall be submitted in accordance with Section Design After Award.

## 12-11 FIRE ALARM REQUIREMENTS

12-11.1 **General.** All buildings shall have fire alarm system including fire alarm panel, transmitter, and fire alarm annunciator, meeting FAC, ADAAG, LSC, UFC and UFGS 13851. All fire alarm systems shall be Class A, looped, addressable systems. Each building shall have a fire alarm panel and annunciator located inside the building on the 1<sup>st</sup> floor in an approved location. Special fire alarm requirements are found in UFC.

12-11.2. **T tapping.** T tapping of any fire alarm circuit is not allowed.

12-11.3. **Occupant notification.** All buildings shall be provided with visible and audible occupant notification appliances in accordance with ADAAG and FAC.

12-11.4. **Sequence of operation.** Fire alarm sequence of operations shown in the Fire Alarm Control Matrix (MATRIX) contained in Attachment 5.

12-11.5. **Server and Telecom Rooms.** Automatic smoke detection system shall be provided for the Server and Telecom rooms below raised floor and below ceiling, NFPA 75.

## 12-12 ROOF ACCESS

12-12.1 **Access Points.** Provide two roof access points for each of the buildings in this RFP (Bldgs 355, 356, 357 and 358), in accordance with the subsequent paragraphs.

12-12.2 **Access Locations.** For Building 355, the two roof access locations shall be on the third floor at the top landing of open exit stairs at grid lines "3" and "18". For Buildings 356, 357, and 358, the two roof access locations shall be on the third floor at the top landing of enclosed exit stairs at grid lines "2" and "20". Multiple roof access from a single exit stair shall not be permitted.

12-12.3 **Roof Access.** Roof access shall consist of hatch opening to the roof with an appropriate ladder. Clear hatch opening must be not less than 1.5 m<sup>2</sup> (16 ft<sup>2</sup>) in area, with a minimum dimension of 610 mm (2 ft). Ladder shall conform to 29 CFR 1910.27, *Fixed Ladders*.

## 12-13 MISCELLANEOUS FIRE REQUIREMENTS

12-13.1. **Fuel tanks.** Fuel tanks installed for the fire pump shall be installed in accordance with UFGS

13920A, local and Federal requirements.

12-13.1.1 Provide single walled fuel tank as indicated on the attached drawings or aboveground concrete encased steel storage tank in an approved location. Aboveground concrete encased steel storage tanks are preferred by the Director of Public Works. Aboveground tank shall be located minimum 50 feet from above ground power lines. Distance from building and property lines shall be  $\frac{1}{2}$  of that indicated in 1022, 8.3.5.2.

12-13.1.2 Provide all appurtenances in 1022, Table 2 and NFPA 30, 2.3.2.3.3. General requirements of 1022, 8.5 shall be provided. Tank capacity shall not exceed 12,000 gallons. 40 CFR 112 requirements shall be provided, if the tank storage capacity exceeds 1320 gallons or a single container exceeds 660 gallons.

12-13.2. **Air handling units.** All air handling systems shall be provided with automatic shutdown in accordance with NFPA 90A. Air handling systems shall meet NFPA 90A and LSC.

12-13.4. **Server and Telecom Rooms.** Fire/smoke dampers are required in all ducts penetrating the Server and Telecom rooms. Other fire protection requirements of NFPA 75 shall be provided for the Server and Telecom rooms.

12-13.5. **Grease Ducts.** Commercial kitchen type grease hoods with fire suppression shall be provided. Except for the cooking appliances in the Billeting Modules, commercial type kitchen exhaust hoods shall be provided for all cooking appliances including, but not limited to appliances in the Dining Facility and 2<sup>nd</sup> Floor Kitchen in Building 357. Grease hood and fire suppression system shall conform to NFPA 96. Grease ducts shall conform to Chapter 10 - HVAC.

## CHAPTER 15

## HISTORIC PRESERVATION

15-1 **DESIGN BACKGROUND.** Quad C is recognized as a historically significant group of structures, and is a contributing element in the Schofield Barracks Historic District, which is listed on the National Register of Historic Places. Every effort has been made in this design to retain the historic fabric of the buildings that constitute Quad C. Specific character-defining features and their treatment in the proposed design are discussed below.

15-2 **GUIDELINES.** Rehabilitation of Quad C and all new construction shall be consistent with The Secretary of the Interiors Standards for Rehabilitation & Illustrated Guidelines for Rehabilitating Historic Buildings, (1997). Both the exterior and the interior work will retain, repair, or replace, in-kind, all character defining features.

15-3 **DEMOLITION.** No additional or unapproved demolition work shall be proposed to any of the four buildings at Quad C. Wherever possible, additions previously constructed that are not original to the four buildings, shall be removed.

15-4 **ADDITIONS.** No new additions shall be constructed to any of the four buildings at Quad C.

15-5 **WINDOWS.** The rhythm of original window openings and window size and shape of the exterior windows shall be retained. The windows will match their original height, eliminating the blank panels and vents that exist in the existing building. New windows shall be installed in the openings to match the original windows in appearance. Real or false muntins will be installed that match the patterns in the original windows. If false muntins are used, muntins shall be installed on both sides of each window.

15-5.1 If metal window frames are utilized, window frames, finish, and color shall match those used at Quad F. Glass provided at Quad F are "All Season Commercial 5/16 tint lam (1/8 Solex, Ann, 060clr, 1/8 clear ann) with 0.62 shading coefficient, 72% visible light transmittance". Paint finish is "Fluoro Guard Powder Coating, color #14284, Sierra Tan". Contractor to verify all finishes and colors. All exposed surfaces of the metal should be painted. Window frame style, finish and color shall be approved by the CRM.

15-5.2 Structural glazing system should be utilized to allow the required thickness of the window sash frame to be reduced. Sash frame and muntin and mullion thickness that match the original dimensions as closely as possible should be used.

15-5.3 Window glazing shall be visibly clear, and tinting shall not be dark or reflective. Glazing shall be the same as used at Quad F, and shall be approved by the CRM.

15-5.4 Louvers used in original window openings shall be painted the same color as the window frames.

15-5.5 All hardware selected shall be of an appropriate historic style to be compatible with the original historic style windows. All hardware selections shall be approved by the CRM.

15-5.6 All existing window openings adjacent to the exterior walkways shall be almost entirely retained. The only window openings that will not be retained are where fire safety code requirements do not allow an opening adjacent to a fire exit. Here the opening shall be in-filled with a reveal so that the shape of the original opening is still apparent.

15-6 **DOORS.** All original door openings, especially those adjacent to the exterior walkways, shall

be almost entirely retained. Where original door openings have been filled in, or partially in-filled to provide a window, the opening shall be returned to a door. Doors shall match the appearance of the original doors. Where operable doors are not desired, fixed doors or a false door shall be used that has the same appearance as the original doors.

15-6.1 All hardware selected shall be of an appropriate historic style to be compatible with the original historic style doors. All hardware selections shall be approved by the CRM.

15-7 **EXTERIOR WALKWAYS.** All exterior balcony walkways on the quadrangle side of the buildings shall be kept open, and shall not be enclosed. If enclosure is absolutely unavoidable, the arched openings shall not be affected. Wherever possible, walkway areas that have previously been enclosed shall be returned to the original open layout.

15-7.1 The open breezeway at the first floor of Building 355 shall be kept open.

15-7.2 Exterior rails: Galvanized steel pipe rails will be installed to match the original rail design (see original drawings or the railings at Quad B for original rail size and style). Compliance with current code requirements for a maximum of 4" spherical clearance between rails will be accomplished with the addition of 3-inch steel pipe railing and post (typical) with 1/8-inch diameter cable pickets, and 1-1/2-inch steel pipe railing and post (typical) with 1/8-inch diameter cable pickets at the open stairwell. This will restore the basic appearance of the rails while improving safety in as unobtrusive a manner as possible. The existing concrete railings shall be retained.

15-8 **ROOF.** Where the roof structure is to be replaced, the original decorative eave soffit details shall be reconstructed and installed. Original construction drawings and historic photographs shall be consulted for the design.

15-9 **MECHANICAL AND ELECTRICAL EQUIPMENT.** To the maximum extent possible, mechanical equipment will be housed out of sight. Large utility equipment will be kept out of the quadrangle courtyard area as much as possible, and will be located to negatively impact the historic structures to the minimum extent possible.

15-9.1 Existing interior space will be utilized to house new mechanical, electrical, and communication equipment. All existing mechanical and/or electrical conduits or chases shall be removed, reduced or entirely relocated, wherever possible, to reduce visual impact to the historic character of Quad C. No chiller lines or condensate drain lines will be visible on the exterior of the building. This will be an improvement from the existing condition.

15-10 **ELEVATOR.** The new elevator shall be designed and installed to minimize visual impact to the historical character of Building 355 and to Quad C, as a whole.

15-11 **GYMNASIUM.** The gymnasium was originally used as a theater, and is one of the few areas in the four buildings that still remains in a layout similar to the original. This room shall remain as a large open space, and shall not have any enclosures or divisions constructed on the interior. The original operator's room and stair leading to it shall be retained, as well as the historic small wood windows inside the operator's room. The arched impressions, decorative moldings, and windows to the operator's room located at the gymnasium walls shall be retained. Structural analysis has indicated that the existing concrete walls require strengthening to meet current codes and standards. The RFP or DB designers shall attempt to find a solution for the strengthening of the walls in the gymnasium that will not obscure the decorative moldings at the walls. **This may require ending the wall thickening below the molding, or strengthening the wall from the outside.**

15-12 **PAINTING.** Exterior walls shall be entirely painted the light color of the standard paint color

scheme except for the bottoms of the walls, which may be painted the darker color. The decorative frieze at the top of the building walls and the horizontal band between floor levels shall not be painted a contrasting color, and shall be painted the same light color as the walls. Doors and door frames may be either the dark color of the base, or the medium tone color of the window frames or base trim color.

15-12.1 Painting schedule and all paint colors shall be approved by CRM.

## **ATTACHMENTS**

- 1 SIGN TYPES
- 2 WATER ANALYSIS
- 3 PLUMBING AND HVAC DESIGN ANALYSIS
- 4 COOLING LOAD CALCULATIONS, VAC EQUIPMENT SELECTION, PLUMBING CALCULATIONS, PLUMBING EQUIPMENT SELECTION, AND CENTRAL MECHANICAL PLANT
- 5 FIRE PROTECTION DESIGN ANALYSIS AND CALCULATIONS
- 6 FIRE ALARM SEQUENCE OF OPERATION MATRIX
- 7 EXCAVATION PERMIT
- 8 LANDSCAPE DESIGN ANALYSIS
- 9 BLAST AND PROGRESSIVE COLLAPSE VULNERABILITY ASSESSMENT
- 10 SEISMIC EVALUATION AND REHABILITATION REPORT
- 11 FOOD SERVICE DESIGN ANALYSIS
- 12 FOOD SERVICE EQUIPMENT BROCHURES
- 13 SUSTAINABLE DESIGN SPIRIT CHECKLIST
- 14 RFP LIST OF DRAWINGS
15. PROPOSAL DATA SHEET
16. UFGS SECTION 13280A ASBESTOS ABATEMENT
17. UFGS SECTION 13281A LEAD HAZARD CONTROL ACTIVITIES
18. UNDERGROUND STORAGE TANK, PCB BALLAST, AND MERCURY LIGHT SWITCH INSPECTION FOR BLDGS. 355, 356, 357, AND 358
19. ASBESTOS INSPECTION REPORTS, QUAD C - BLDGS. 357 AND 358
20. BLDG 358
21. ASBESTOS INSPECTION REPORTS, QUAD C - BLDGS. 355 AND 356
22. BLDG. 356
23. WATER DISTRIBUTION ANALYSIS
24. TELECOMM DETAILS
25. GEAR WASH/RECREATION BUILDING
26. PRELIMINARY SOILS REPORT
27. GTB DETAILS

- 28. QUAD C RFP INFORMATION DRAWINGS
- 29. **PROGRESSIVE COLLAPSE VULNERABILITY ASSESSMENT**
- 30. **CONCEPT DESIGN ANALYSIS OF EXISTING STRUCTURAL SYSTEM**
- 31. **CONTRACTOR OPERATIONS AND STORAGE AREA**

## ATTACHMENT 10

### SEISMIC EVALUATION AND REHABILITATION REPORT

(AM-0002)



# ***SEISMIC EVALUATION and REHABILITATION REPORT***

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WHOLE BARRACKS RENEWAL  
BRIGADE COMPLEX, PHASE 3A, QUAD C  
FY03 MCA PN52068 & BUP 52069  
SCHOFIELD BARRACKS, OAHU, HAWAII

## ***VOLUME TWO***

May 2003

### PREPARED FOR:

DEPARTMENT OF THE ARMY  
U.S. Army Engineer District, Honolulu  
Engineering Services Branch  
Engineering and Construction Division  
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- 2.2 Building Construction
- 2.3 Material Properties and Evaluation Criteria

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- 3.2 Seismic Screening: Tier 2 Evaluation
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### **APPENDIX A: TIER 2 EVALUATION**

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## 1.0 INTRODUCTION

This report addresses seismic evaluation and rehabilitation issues for the Quad "C" buildings at Schofield Barracks, Oahu, Hawaii in accordance with the task order scope of work for "FY03 MCA and BUP PN52069, Whole Barracks Renewal Brigade Complex, Phase 3A, Quad C, Schofield Barracks, Oahu, Hawaii (Concept Design for Design-Build RFP package)". The site and buildings are described in Section 2. Section 3 summarizes the seismic evaluation findings and the proposed retrofit and includes building layouts incorporating the retrofit recommendations.

### 1.1 Background

The U.S. Army Corps of Engineers issued a Request For Proposal (RFP) for renovations to Quad "C" at Schofield Barracks, Hawaii. As stated in the RFP, contractors were to design and lay out Quad "C" renovations, which incorporated requirements to meet seismic and antiterrorism/ force protection (AT/FP) criteria and historical preservation requirements. AT/FP issues were addressed by Hinman Consulting Engineers, Inc. and are included in a separate report.

This report proposes a retrofit strategy designed to meet the above criteria and is a concept design only (for the design-build package). The Design Build contractor shall be responsible for providing the final design and retrofit for Quad "C" — subject to the requirements in the RFP package.

### 1.2 References

The following references were used in the preparation of this report:

- *TI 809-04, Seismic Design for Buildings*, dated 31 Dec 1998;
- *TI 809-05, Seismic Evaluation and Rehabilitation for Buildings*, dated Nov 1999;
- *FEMA 273, NEHRP Guidelines for the Seismic Rehabilitation of Buildings*, dated Oct 1997;
- *FEMA 302, NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures*, dated Feb 1998;
- *FEMA 310, Handbook for the Evaluation of Buildings — A Prestandard*, dated Jan 1998;
- *ACI 318-95, Building Code Requirements for Structural Concrete and Commentary*, dated Feb 1996;

- Excerpts from the original design drawings dated 1917. Drawings reviewed were primarily for Building 355;
- Drawings for the Modernization of Barracks Quads C & J and Medics Area dated 1973;
- Corps of Engineers architectural plans for FY03 MCA and BUP PN52069 dated 31 Oct 2002;
- *Seismic Evaluation & Anti-Terrorism/Force Protection Study for Whole Barracks Renewal, Phase 4A, Renovations of Quad "F", Schofield Barracks, Hawaii*, by SSFM International, Inc., dated 20 Aug 2001;
- *Progressive Collapse Vulnerability Assessment, Buildings 355, 356, 357, and 358, Schofield Barracks, Oahu, Hawaii, Final Report*, by Hinman Consulting Engineers, Inc. dated 2 May 2003.

### 1.3 Scope of Work

Based on the above references and the task order indicated, Mitsunaga and Associates, Inc. performed the following tasks for this report:

- Reviewed available existing drawings and concept plans for the Quad "C" renovations;
- Reviewed seismic studies for similar adjacent buildings (Quad "F");
- Reviewed AT/FP recommendations for Quad "C" and similar adjacent buildings (Quad "F");
- Performed a general visual inspection on the condition of the existing buildings;
- Performed a full building evaluation (Tier 2 analysis) on one building in Quad "C" to identify structural deficiencies in the existing lateral load-resisting system; and
- Developed conceptual level retrofit schemes to bring the building into compliance with the above-referenced codes, standards, renovation concept plans, and AT/FP criteria.

## **1.4 Limitations and Exclusions**

- Detailed design was not included in the scope of this work and is to be performed by the Design/Build contractor in consultation with a qualified, licensed structural engineer;
- Retrofit recommendations incorporated the renovation concept plans and AT/FP criteria for Quad "C" that were available at the time of this report and on material testing for similar adjacent buildings (Quad "F");
- Analysis of the existing structure for other than seismic loads was outside the scope of work for this report;
- Cost estimating was not included in the scope of work for this report; and
- This report does not address any other portions of the structure or property other than those areas mentioned, nor does it accord warranty, either expressed or implied, for any portion of the existing structures.

## **2.0 SITE AND BUILDING DESCRIPTION**

This section describes the site layout and building descriptions.

### **2.1 Building Location and Layout**

Quad C is a block of four multi-use buildings (355, 356, 357, and 358) within the Schofield Barracks installation on the island of Oahu, Hawaii. The buildings are arranged in a square pattern around an interior courtyard and are bounded by streets on three sides and an open parking lot on the fourth side. Access roads at the corners of the block lead to the interior courtyard.

Buildings 355, 356, 357, and 358 are three-story rectangular structures approximately 364 feet long by 61 feet wide by 42 feet high. Two "bump outs" are located on the courtyard side of Buildings 356, 357, and 358 at the one third points of the building. Building 355 houses a gymnasium on the 3<sup>rd</sup> floor. All buildings have exterior corridors and stairs facing the courtyard.

### **2.2 Building Construction**

The buildings are reinforced concrete structures with a "mixed" framing system: concrete floor slabs are supported by concrete bearing walls along the exterior of the building and by concrete

frames along the interior, all running in the longitudinal direction. The columns and walls are supported on spread footings. The suspended floors are conventionally reinforced concrete slabs, 6 inches thick at the interior floors and 4 inches thick concrete at the exterior corridors. Two-inch thick concrete walls run transversely at the quarter points of the buildings.

The existing roof typically consists of 2x wood decking supported on 2x8 rafters spaced at 16 inches on center on wood trusses running over the interior columns. A grid of concrete beams below the trusses provides some stability to the roof structure and the exterior walls. The roof over the gymnasium in Building 355 was constructed more recently and consists of metal decking supported on structural steel trusses spaced at 10 feet on center and spanning transversely between the exterior walls.

For a detailed evaluation of the lateral load-resisting system, see Section 3.

### **2.3 Material Properties and Evaluation Criteria**

Based on the Seismic Evaluation & Anti-Terrorism/Force Protection Study for Quad "F", the following material properties were used for the existing structure:

Reinforcing Steel Strength:  $f_y = 40,000$  psi  
Concrete Strength:  $f'_c = 2,500$  psi

For new construction, and construction in conjunction with the existing structure (such as new shotcrete applied to existing walls), the following conservative material properties were used:

Reinforcing Steel Strength:  $f_y = 60,000$  psi (no contribution from existing reinforcing)  
Concrete Strength:  $f'_c = 3,000$  psi

Also, based on the Quad "F" study, the following seismic parameters were used:

Short Period Spectral Response Acceleration Parameter,  $S_s = 0.60$   
Spectral Response Acceleration Parameter at 1 Second,  $S_1 = 0.17$

Seismic Use Group II  
Performance Level: Immediate Occupancy (IO)  
Site Class E

### **3.0 FINDINGS AND RECOMMENDATIONS**

This section presents the findings on the evaluation of the existing Quad "C" buildings and the proposed seismic retrofit strategy.

#### **3.1 Description of the Existing Lateral System**

The primary lateral load-resisting elements for the existing structures are the exterior concrete shear walls located on all four sides of each building. Concrete frames running in the longitudinal direction at all levels offer minimal lateral resistance when compared to the walls (see rigidity calculations in Appendix A) and are therefore excluded from the lateral load-resisting system. Except for the side walls, the only structural elements having significant lateral resistance in the transverse direction are the 2-inch thick concrete partition walls typically located at the quarter points of each building. These walls are included in the system in order to limit the span-to-depth ratio of the floor diaphragms in the transverse direction.

Based on the existing drawings, the exterior walls are 8 inches thick at the ground and 2<sup>nd</sup> floors, and 6 inches thick at the 3<sup>rd</sup> floor. No.3 bars spaced at 24 inches on center are shown on each side and on each face of the walls on the ground and 2<sup>nd</sup> floors. On the 3<sup>rd</sup> floor, a 6-inch by 6-inch No.6 wire mesh is shown at the center of the wall.

Non-destructive testing did not detect reinforcing around the wall openings for Quad "F". The lateral capacity of the shear walls for Quad "C" may, therefore, be limited by the flexural capacity of the wall piers rather than by the shear capacity of the wall (since vertical reinforcing may not be present at the ends of the piers).

At the roof level, where the flexible wood diaphragm limits the allowable span between load-resisting elements, the concrete frames, spaced approximately 20 feet on center, must be used as part of the lateral system. Calculations on the capacity of the wood diaphragm are included in Appendix A. However, it does not appear from the existing drawings that adequate bracing is present to transfer loads from the roof diaphragm to the concrete frames.

#### **3.2 Seismic Screening: Tier 2 Evaluation**

According to FEMA Table 3-3, concrete frames having a flexible diaphragm (at the roof), in a "High" region of seismicity and at a performance level designated as "Immediate Occupancy", cannot be evaluated by a Tier 1 checklist evaluation. A Tier 2 "full building" evaluation was, therefore, performed in accordance with TI 809-05 and FEMA 310 using the Linear Static Procedure. The Tier 2 evaluation is presented in Appendix A.

Based on the results of the Tier 2 evaluation, the following structural deficiencies were identified:

- The shear capacity of the wood roof diaphragm was exceeded;
- The shear and flexural capacities of the concrete frame beams and columns at the 3<sup>rd</sup> floor were exceeded; and
- The shear and flexural capacities of the exterior concrete shear walls were exceeded.

### **3.3 Seismic Retrofit Recommendations**

The following seismic rehabilitation strategy proposes to eliminate the structural deficiencies identified in the Tier 2 evaluation while also incorporating progressive collapse requirements for the exterior walls, the renovation concept plans, and the historical preservation criteria referenced. Documentation for the proposed rehabilitation is presented in Appendix B.

#### **3.31 Roof System**

Replacement of the existing wood roof with a new metal deck roof and structural steel framing will provide sufficient diaphragm strength for the distribution of seismic forces to the transverse concrete frames below. The weight of the proposed roof system is comparable to the present system and will, therefore, not impose additional gravity and seismic loads to the supporting structure.

The roof system will also meet AT/FP blast requirements.

#### **3.32 Exterior Walls**

The shear and flexural capacities of the exterior walls are improved by retrofitting with shotcrete applied to the interior surface of the wall. Positive connection to the existing structure is required for the entire wall to perform as designed. Additional wall reinforcing in the shotcrete increases the flexural capacity of the entire wall and its components.

Final wall thicknesses for seismic rehabilitation were selected in conjunction with progressive collapse requirements. At the inner Quad walls (facing the courtyard), shotcrete was added primarily to improve the flexural performance of the wall and its components, by providing concrete cover for additional wall reinforcing. Retrofitted walls are presented in Figures 1 thru 12 at the end of this Section. The exterior wall retrofit to the interior surfaces will also satisfy historical preservation criteria.



### **3.33    *Added Transverse Walls***

Additional transverse concrete shear walls are required at the interior of the building to minimize seismic forces on the exterior walls and to reduce span-to-depth ratios of the floor diaphragms.

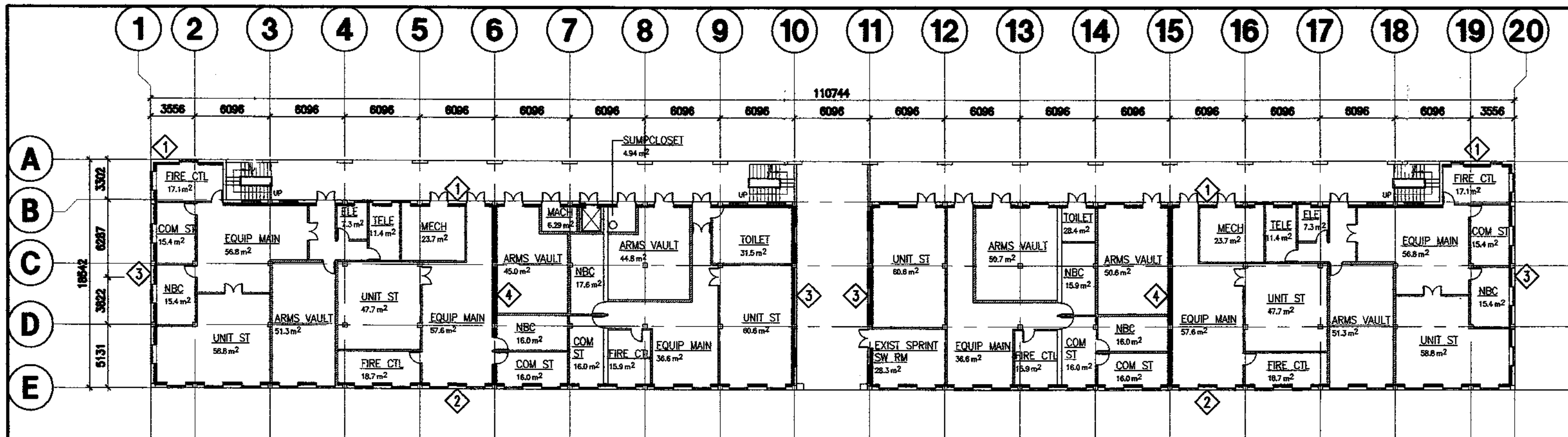
The added walls were aligned with the building grids and incorporated into the concept plans for the building renovations and are presented in Figures 1 thru 12 at the end of this Section.

### **3.34    *Concrete Frames at the 3<sup>rd</sup> Floor***

Retrofitting one bay of each concrete transverse frame at the 3<sup>rd</sup> floor is required to transfer roof diaphragm forces to the supporting structure below. Additional interior shear walls at the 3<sup>rd</sup> floor were not considered, since the diaphragm capacity of the roof system would dictate a closer shear wall spacing than is practical.

## **3.4    .    *Shear Wall Retrofit Figures (1-12)***

The shear wall retrofit schemes for Buildings 355, 356, 357, and 358 are presented on the following Figures 1 thru 12.



### SHEARWALL RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION
1	RETROFIT 4" SHOTCRETE WALL
2	RETROFIT 6" SHOTCRETE WALL
3	RETROFIT 8" SHOTCRETE WALL
4	NEW 8" CONCRETE WALL

### BUILDING 355 - FIRST FLOOR PLAN



**MITSunaga & ASSOCIATES**  
 747 AMANA STREET, STE. 216  
 HONOLULU, HAWAII 96814

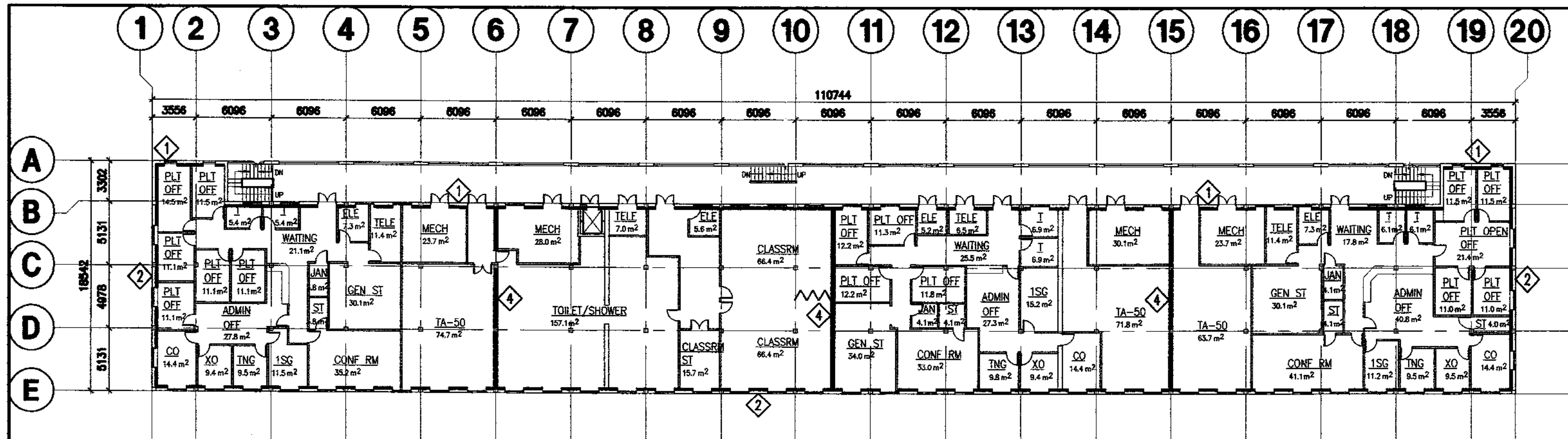
SEISMIC EVALUATION and REHABILITATION REPORT  
 for QUAD "C" WHOLE BARRACKS RENEWAL  
 SCHOFIELD BARRACKS, OAHU, HAWAII  
**BUILDING 355, FIRST FLOOR PLAN**

SCALE: NO SCALE

DATE: FEBRUARY 6, 2003

FIGURE

1



### SHEARWALL RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION
1	RETROFIT 4" SHOTCRETE WALL
2	RETROFIT 6" SHOTCRETE WALL
4	NEW 8" CONCRETE WALL

### BUILDING 355 - SECOND FLOOR PLAN



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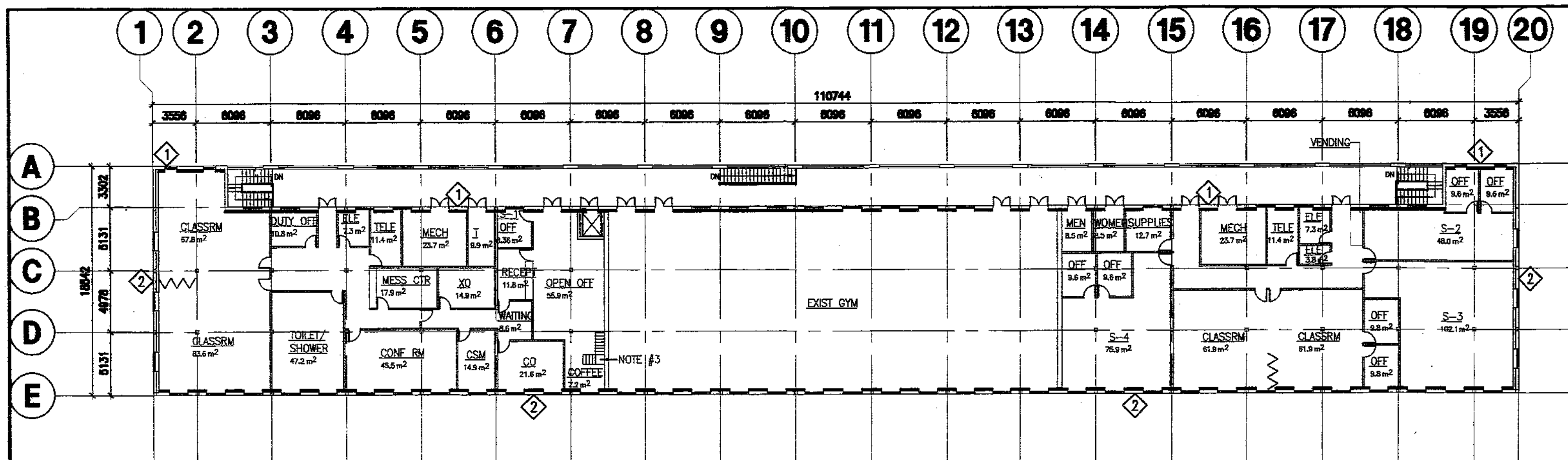
SEISMIC EVALUATION and REHABILITATION REPORT  
 for QUAD "C" WHOLE BARRACKS RENEWAL  
 SCHOFIELD BARRACKS, OAHU, HAWAII  
 BUILDING 355, SECOND FLOOR PLAN

SCALE: NO SCALE

DATE: FEBRUARY 6, 2003

FIGURE

2



**BUILDING 355 - THIRD FLOOR PLAN**

**SHEARWALL RETROFIT SCHEDULE**

DESIGNATION	DESCRIPTION
1	RETROFIT 4" SHOTCRETE WALL
2	RETROFIT 6" SHOTCRETE WALL



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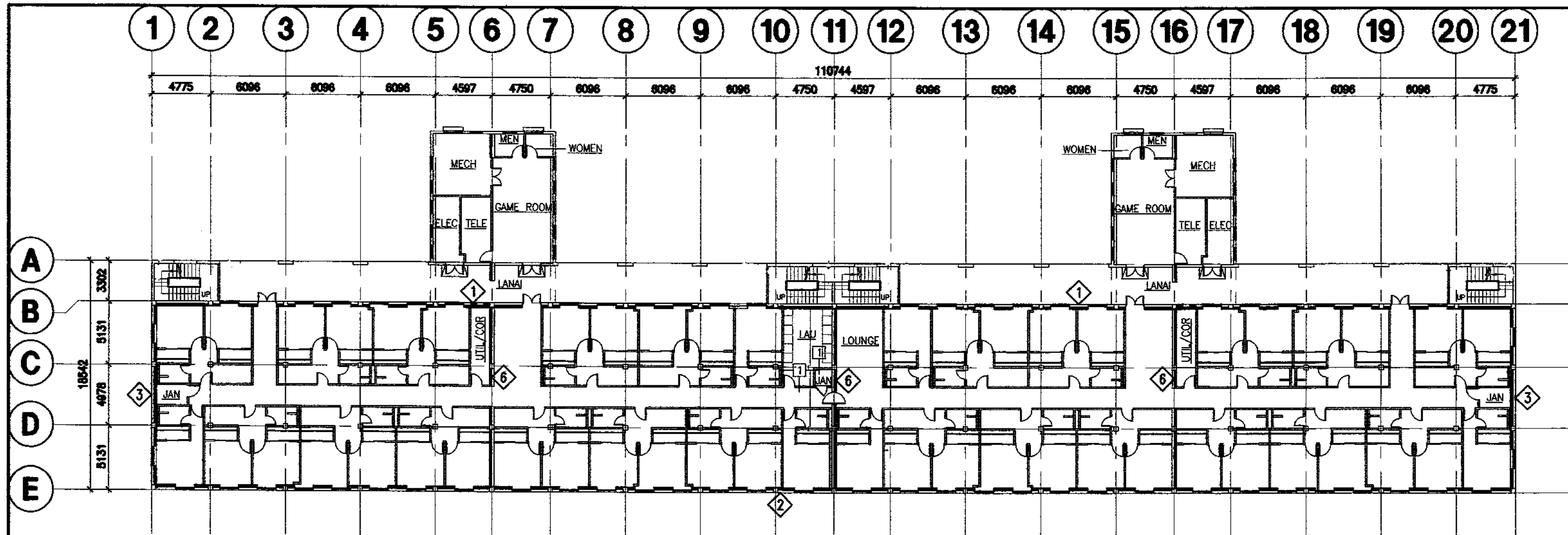
SEISMIC EVALUATION and REHABILITATION REPORT  
for QUAD "C" WHOLE BARRACKS RENEWAL  
SCHOFIELD BARRACKS, OAHU, HAWAII  
BUILDING 355, THIRD FLOOR PLAN

SCALE: NO SCALE

DATE: FEBRUARY 6, 2003

FIGURE

**3**



### SHEARWALL RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION
1	RETROFIT 4" SHOTCRETE WALL
2	RETROFIT 6" SHOTCRETE WALL
3	RETROFIT 8" SHOTCRETE WALL
6	NEW 14" CONCRETE WALL

### BUILDING 356 - FIRST FLOOR PLAN



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 HONOLULU, HAWAII 96814

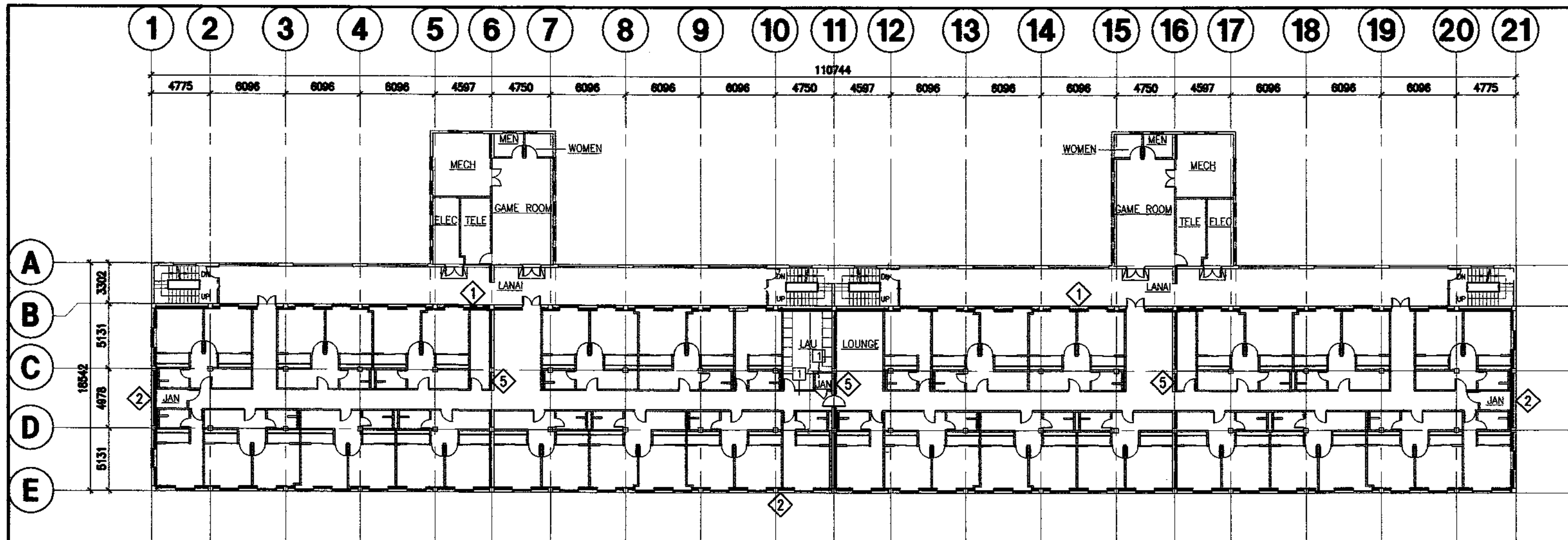
SEISMIC EVALUATION and REHABILITATION REPORT  
 for QUAD "C" WHOLE BARRACKS RENEWAL  
 SCHOFIELD BARRACKS, OAHU, HAWAII  
**BUILDING 356, FIRST FLOOR PLAN**

SCALE: NO SCALE

DATE: FEBRUARY 6, 2003

FIGURE

**4**



# **SHEARWALL RETROFIT SCHEDULE**

DESIGNATION	DESCRIPTION
1	RETROFIT 4" SHOTCRETE WALL
2	RETROFIT 6" SHOTCRETE WALL
5	NEW 10" CONCRETE WALL

# **BUILDING 356 - SECOND FLOOR PLAN**



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 747 AMANA STREET, STE. 216  
 HONOLULU, HAWAII 96814

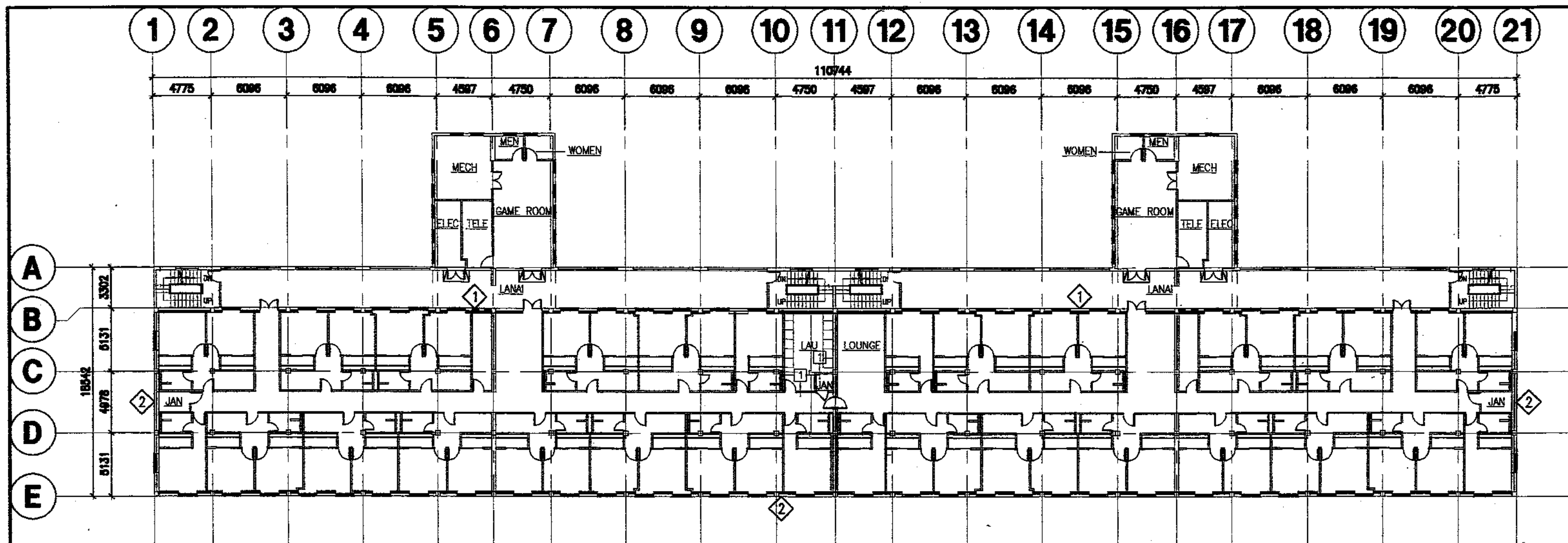
SEISMIC EVALUATION and REHABILITATION REPORT  
 for QUAD "C" WHOLE BARRACKS RENEWAL  
 SCHOFIELD BARRACKS, OAHU, HAWAII  
 BUILDING 356, SECOND FLOOR PLAN

SCALE: NO SCALE

DATE: FEBRUARY 6, 2003

FIGURE

**5**



### SHEARWALL RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION
1	RETROFIT 4" SHOTCRETE WALL
2	RETROFIT 6" SHOTCRETE WALL

### BUILDING 356 - THIRD FLOOR PLAN



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 HONOLULU, HAWAII 96814

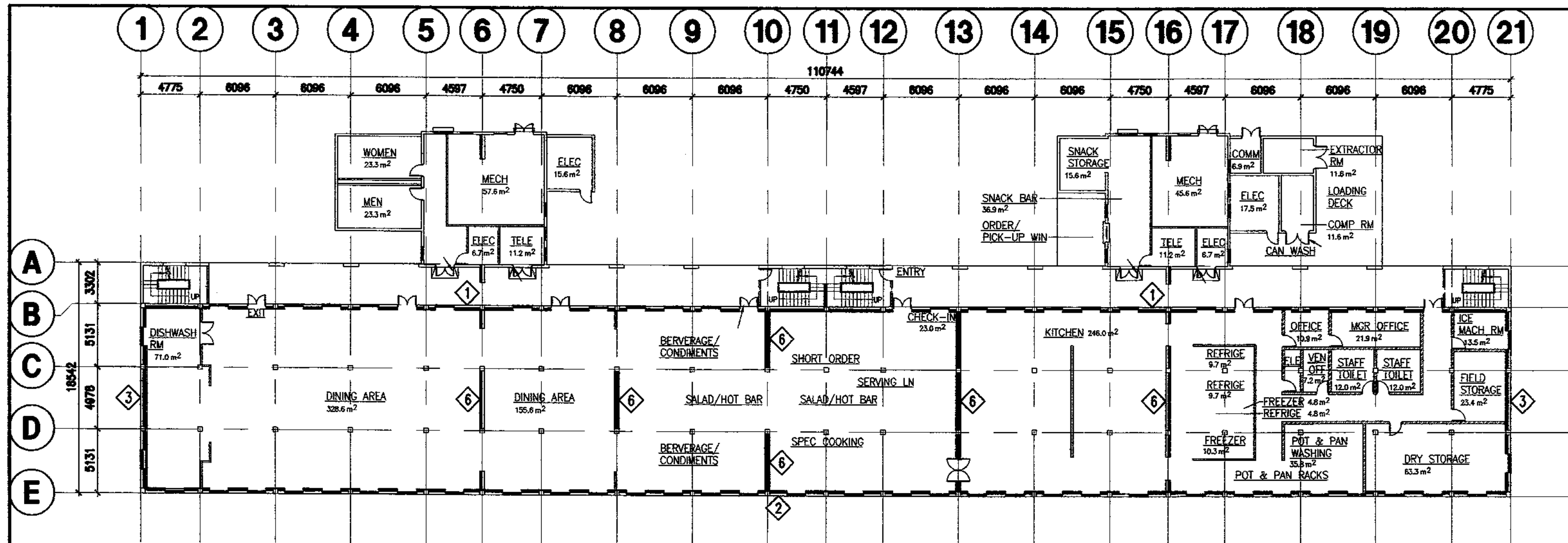
SEISMIC EVALUATION and REHABILITATION REPORT  
 for QUAD "C" WHOLE BARRACKS RENEWAL  
 SCHOFIELD BARRACKS, OAHU, HAWAII  
 BUILDING 356, THIRD FLOOR PLAN

SCALE: NO SCALE

DATE: FEBRUARY 6, 2003

FIGURE

6



## SHEARWALL RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION
1	RETROFIT 4" SHOTCRETE WALL
2	RETROFIT 6" SHOTCRETE WALL
3	RETROFIT 8" SHOTCRETE WALL
6	NEW 14" CONCRETE WALL

## BUILDING 357 - FIRST FLOOR PLAN



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747 AMANA STREET, STE. 216  
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT  
for QUAD "C" WHOLE BARRACKS RENEWAL  
SCHOFIELD BARRACKS, OAHU, HAWAII  
BUILDING 357, FIRST FLOOR PLAN

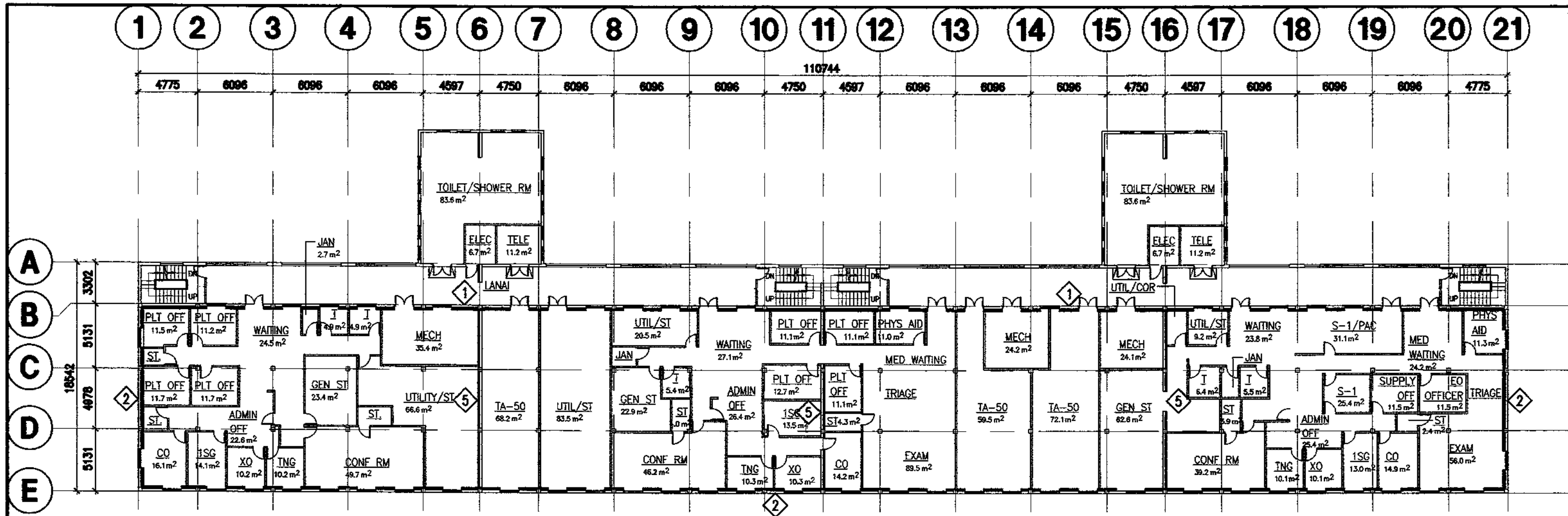
SCALE: NO SCALE

DATE: FEBRUARY 6, 2003

FIGURE

7





### SHEARWALL RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION
1	RETROFIT 4" SHOTCRETE WALL
2	RETROFIT 6" SHOTCRETE WALL
5	NEW 10" CONCRETE WALL

### BUILDING 357 - SECOND FLOOR PLAN



**MITSunAGA & ASSOCIATES**  
 747 AMANA STREET, STE. 216  
 HONOLULU, HAWAII 96814

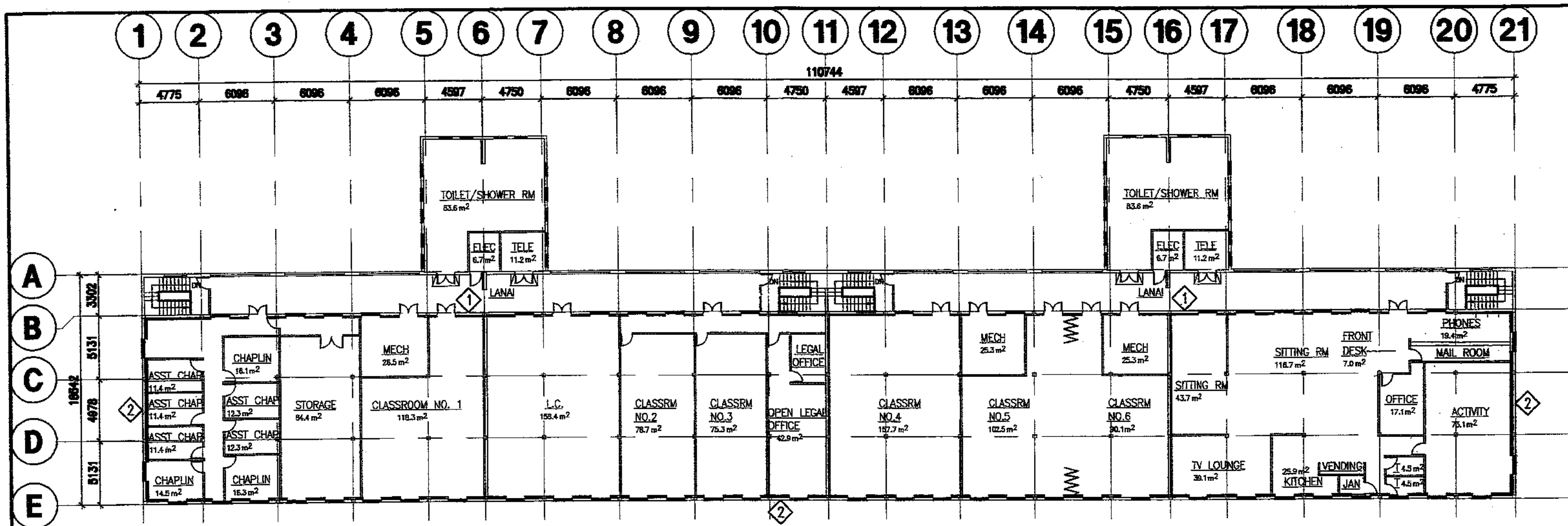
SEISMIC EVALUATION and REHABILITATION REPORT  
 for QUAD "C" WHOLE BARRACKS RENEWAL  
 SCHOFIELD BARRACKS, OAHU, HAWAII  
**BUILDING 357, SECOND FLOOR PLAN**

SCALE: NO SCALE

DATE: FEBRUARY 6, 2003

FIGURE

**8**



### SHEARWALL RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION
1	RETROFIT 4" SHOTCRETE WALL
2	RETROFIT 6" SHOTCRETE WALL

### BUILDING 357 - THIRD FLOOR PLAN



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HONOLULU, HAWAII 96814

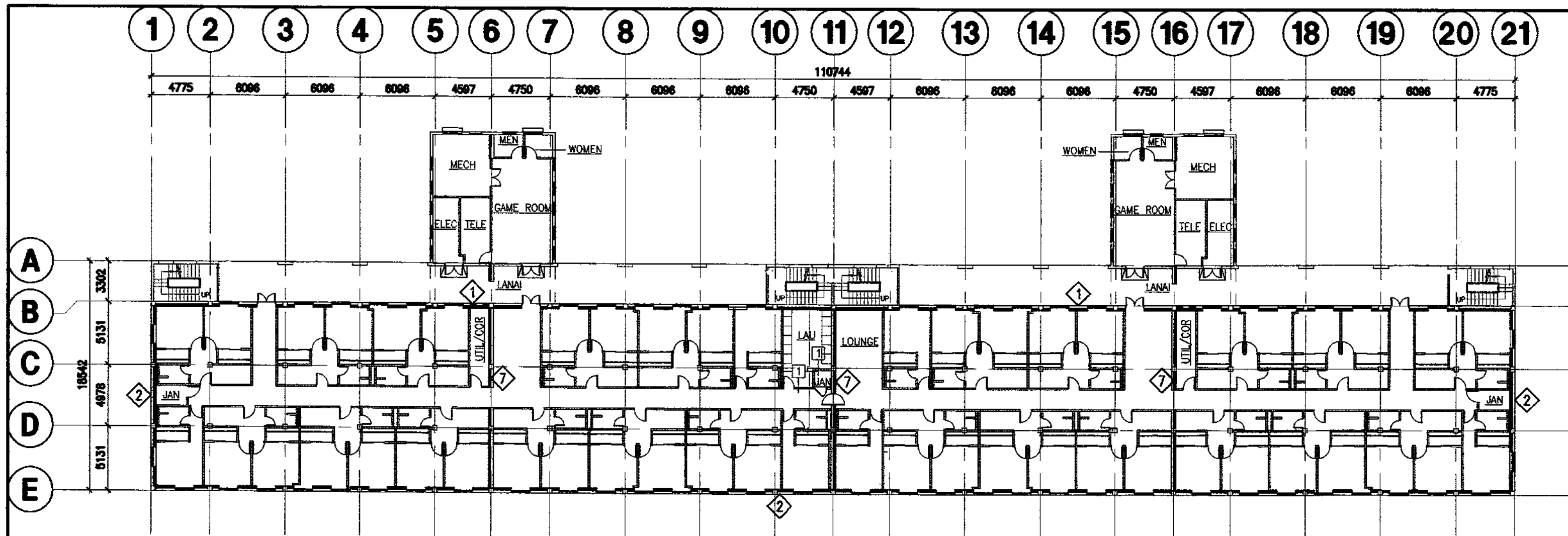
SEISMIC EVALUATION and REHABILITATION REPORT  
for QUAD "C" WHOLE BARRACKS RENEWAL  
SCHOFIELD BARRACKS, OAHU, HAWAII  
BUILDING 357, THIRD FLOOR PLAN

SCALE: NO SCALE

DATE: FEBRUARY 6, 2003

FIGURE

9



### SHEARWALL RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION
1	RETROFIT 4" SHOTCRETE WALL
2	RETROFIT 6" SHOTCRETE WALL
7	NEW 15" CONCRETE WALL

### BUILDING 358 - FIRST FLOOR PLAN



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 HONOLULU, HAWAII 96814

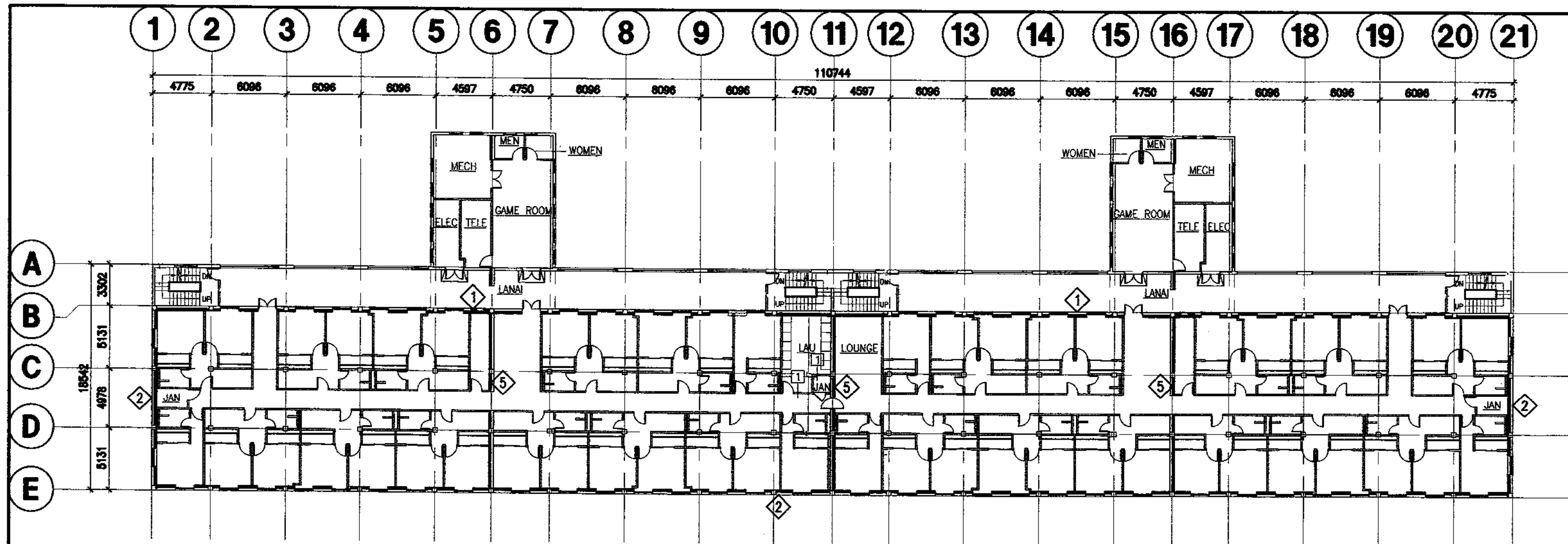
SEISMIC EVALUATION and REHABILITATION REPORT  
 for QUAD "C" WHOLE BARRACKS RENEWAL  
 SCHOFIELD BARRACKS, OAHU, HAWAII  
**BUILDING 358, FIRST FLOOR PLAN**

SCALE: NO SCALE

DATE: FEBRUARY 6, 2003

FIGURE

**10**



### SHEARWALL RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION
1	RETROFIT 4" SHOTCRETE WALL
2	RETROFIT 6" SHOTCRETE WALL
3	RETROFIT 8" SHOTCRETE WALL
5	NEW 10" CONCRETE WALL

### BUILDING 358 - SECOND FLOOR PLAN



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 HONOLULU, HAWAII 96814

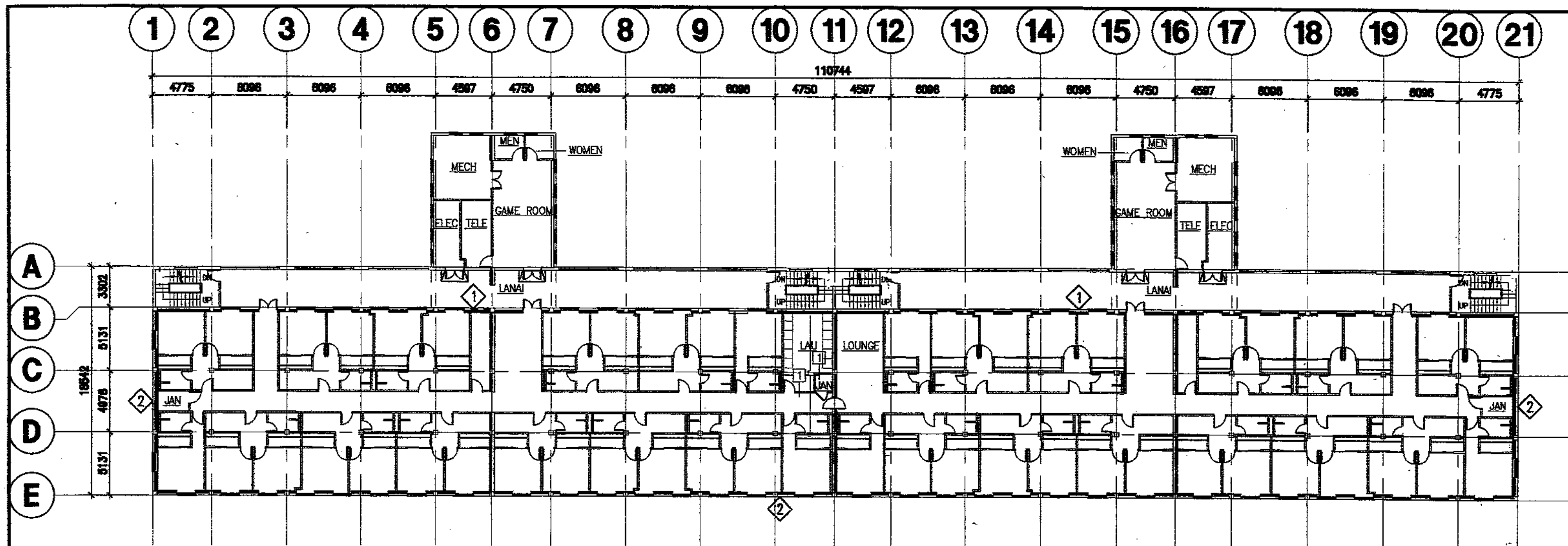
SEISMIC EVALUATION and REHABILITATION REPORT  
 for QUAD "C" WHOLE BARRACKS RENEWAL  
 SCHOFIELD BARRACKS, OAHU, HAWAII  
 BUILDING 358, SECOND FLOOR PLAN

SCALE: NO SCALE

DATE: FEBRUARY 6, 2003

FIGURE

11



### SHEARWALL RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION
1	RETROFIT 4" SHOTCRETE WALL
2	RETROFIT 6" SHOTCRETE WALL

### BUILDING 358 - THIRD FLOOR PLAN



**MITSunaga & ASSOCIATES**  
 747 AMANA STREET, STE. 216  
 HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT  
 for QUAD "C" WHOLE BARRACKS RENEWAL  
 SCHOFIELD BARRACKS, OAHU, HAWAII  
 BUILDING 358, THIRD FLOOR PLAN

SCALE: NO SCALE

DATE: FEBRUARY 6, 2003

FIGURE  
**12**

# ***SEISMIC EVALUATION and REHABILITATION REPORT***

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## ***APPENDIX A: TIER 2 EVALUATION***

WHOLE BARRACKS RENEWAL  
BRIGADE COMPLEX, PHASE 3A, QUAD C  
FY03 MCA PN52068 & BUP 52069  
SCHOFIELD BARRACKS, OAHU, HAWAII

May 2003

PREPARED FOR:

DEPARTMENT OF THE ARMY  
U.S. Army Engineer District, Honolulu  
Engineering Services Branch  
Engineering and Construction Division  
Fort Shafter, Hawaii 96858-5440

PREPARED BY:



Mitsunaga and Associates, Inc.  
747 Amana Street Suite 216  
Honolulu, Hawaii 96814  
Phone: (808) 945-7882 Fax: (808) 946-2563  
Email: Mitsunaga003@hawaii.rr.com

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The Tier 2 evaluation includes the following:

- Dead and live load determination;
- Total building dead load and center of mass determination at each floor level;
- Seismic base shear and force distribution at each floor level;
- Roof diaphragm shear capacity check;
- Estimation of concrete frame rigidities and equivalent solid wall thicknesses;
- Rigidity calculations for shear walls with openings and equivalent solid wall thicknesses;
- Seismic shear distribution to walls based on rigid diaphragm analysis at each floor level and for the roof diaphragm in the longitudinal direction;
- Seismic shear distribution to walls and frames based on flexible diaphragm analysis for the roof diaphragm in the transverse direction; and
- Determination of shear and flexural capacities for walls and frames and comparison with the distributed seismic forces.

## ROOF DIAPHRAGM CHECK

SHEAR CAPACITY OF THE WOOD DECK

ROOF IS A DEFORMATION-CONTROLLED ACTION:

FEMA Section 8.5.2

$$* \text{ For } L/b = 20'/60.58' = 0.33$$

and Immediate Occupancy,  $m = 1$

$$mK V_{CE} > V_{UD}$$

where  $m = 1$

$$K = 1$$

$F_p$  Diaph

Trib width for shear  
for frames @ 20' oc

$$V_{UD} = (1625^k \times 10/363.33) (1/60.58)$$

$$= 738 \#1$$

$$V_{CE} > 738 \#1$$

PER FEMA 273 Section 8.5.2.2,  $V_{CE} = 120 \#1$

THEREFORE, WOOD DECK IS OVERSTRESSED

DESCRIPTION

Mitsunaga & Associates, Inc.

BY:

CHECKED

JOB NO.

SHEET

PROJECT:

QVAD C

DATE

OF



DETERMINE EQUIVALENT WALL THICKNESS  
FOR CONCRETE FRAME AT GROUND FLOOR  
(LONGITUDINAL DIRECTION)

For 1 kip lateral load and  $E = 1/2 E_c$   
(effective stiffness per FEMA 273 Table 6.4)

$$\Delta = .009" \text{ (RISA-2D Output for 1 kip load)}$$

For 1 kip lateral load and  $E = 0.8 E_c$   
(per FEMA 273 Table 6.4 for walls)

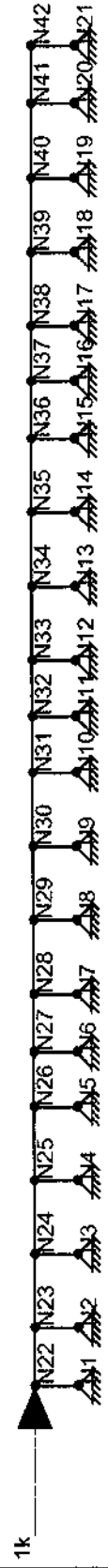
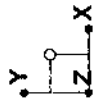
$$\begin{aligned} \Delta_{wall} &= \frac{1}{.8 \times 3122} \left( \frac{h}{6L} \right)^{11.25'} \left[ \frac{h^2}{L^2} + 2.64 \right]^{362.33} \\ &= \frac{2.42 \times 10^{-5}}{b_{equiv}} \quad \text{same length as longitudinal walls} \end{aligned}$$

$$b_{equiv} = 0.0038"$$

Equivalent thicknesses for the front  
and back longitudinal walls are  
5.48" and 5.69", respectively.

CONTRIBUTION OF CONCRETE FRAMES  
TO THE RIGIDITY OF THE STRUCTURE  
IS NEGLIGIBLE!

DESCRIPTION	Mitsunaga & Associates, Inc.	BY:	CHECKED
	PROJECT: Q UAD C	JOB NO.	SHEET OF
		DATE	



Loads: BLC 1, 1 KIP LOAD  
Results for LC 1, 1 KIP

Mitsunaga & Associates, Inc.

Keith Kalani

QUAD C Existing Concrete Frame at Ground Floor

Frame Rigidity: Deflection for 1 kip load

February 5, 2003

6:20 PM

QUADC-ground.r2d

## Global

Steel Code	None
Allowable Stress Increase Factor (ASIF)	1.333
Include Shear Deformation	Yes
No. of Sections for Member Calcs	5
Redesign Sections	Yes
P-Delta Analysis Tolerance	0.50%

## Materials (General)

Material Label	Young's Modulus (ksi)	Shear Modulus (ksi)	Poisson's Ratio	Thermal Coef. (per 10^5 F)	Weight Density (k/ft^3)	Yield Stress (ksi)
CONC	2015	907	.11	.65	.15	2.55

## Sections

Section Label	Database Shape	Material Label	Area (in^2)	SA (0,180)	SA (90,270)	I (90,270) (in^4)	I (0,180) (in^4)	T/C Only
COL		CONC	196	1.2	1.2	3201	3201	
BEAM		CONC	280	1.2	1.2	4573	9333	

## Joint Coordinates

Joint Label	X Coordinate (ft)	Y Coordinate (ft)	Joint Temperature (F)
N1	0	0	0
N2	15.67	0	0
N3	35.67	0	0
N4	55.67	0	0
N5	75.67	0	0
N6	90.75	0	0
N7	106.33	0	0
N8	126.33	0	0
N9	146.33	0	0
N10	166.33	0	0
N11	181.92	0	0
N12	197	0	0
N13	217	0	0
N14	237	0	0
N15	257	0	0
N16	272.58	0	0
N17	287.67	0	0
N18	307.67	0	0
N19	327.67	0	0
N20	347.67	0	0
N21	363.33	0	0
N22	0	11.75	0
N23	15.67	11.75	0
N24	35.67	11.75	0
N25	55.67	11.75	0
N26	75.67	11.75	0
N27	90.75	11.75	0
N28	106.33	11.75	0
N29	126.33	11.75	0
N30	146.33	11.75	0
N31	166.33	11.75	0
N32	181.92	11.75	0
N33	197	11.75	0
N34	217	11.75	0
N35	237	11.75	0
N36	257	11.75	0

Company : Mitsunaga & Associates, Inc.  
 Designer : Keith Kalani  
 Job Number : QUAD C Existing Concrete Frame at Ground Floor

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### Joint Coordinates (continued)

Joint Label	X Coordinate (ft)	Y Coordinate (ft)	Joint Temperature (F)
N37	272.58	11.75	0
N38	287.67	11.75	0
N39	307.67	11.75	0
N40	327.67	11.75	0
N41	347.67	11.75	0
N42	363.33	11.75	0

### Boundary Conditions

Joint Label	X Translation (k/in)	Y Translation (k/in)	Rotation (k-ft/rad)
N1	Reaction	Reaction	
N2	Reaction	Reaction	
N3	Reaction	Reaction	
N4	Reaction	Reaction	
N5	Reaction	Reaction	
N6	Reaction	Reaction	
N7	Reaction	Reaction	
N8	Reaction	Reaction	
N9	Reaction	Reaction	
N10	Reaction	Reaction	
N11	Reaction	Reaction	
N12	Reaction	Reaction	
N13	Reaction	Reaction	
N14	Reaction	Reaction	
N15	Reaction	Reaction	
N16	Reaction	Reaction	
N17	Reaction	Reaction	
N18	Reaction	Reaction	
N19	Reaction	Reaction	
N20	Reaction	Reaction	
N21	Reaction	Reaction	

### Member Data

Member Label	I Joint	J Joint	Rotate (degrees)	Shape / Section Set	Material Set	Phys Memb TOM	End Releases I-End AVM	J-End AVM	End Offsets I-End (in)	J-End (in)	Inactive Code	Length (ft)
M1	N1	N22		COL	CONC	Y						11.75
M2	N2	N23		COL	CONC	Y						11.75
M3	N3	N24		COL	CONC	Y						11.75
M4	N4	N25		COL	CONC	Y						11.75
M5	N5	N26		COL	CONC	Y						11.75
M6	N6	N27		COL	CONC	Y						11.75
M7	N7	N28		COL	CONC	Y						11.75
M8	N8	N29		COL	CONC	Y						11.75
M9	N9	N30		COL	CONC	Y						11.75
M10	N10	N31		COL	CONC	Y						11.75
M11	N11	N32		COL	CONC	Y						11.75
M12	N12	N33		COL	CONC	Y						11.75
M13	N13	N34		COL	CONC	Y						11.75
M14	N14	N35		COL	CONC	Y						11.75
M15	N15	N36		COL	CONC	Y						11.75
M16	N16	N37		COL	CONC	Y						11.75
M17	N17	N38		COL	CONC	Y						11.75
M18	N18	N39		COL	CONC	Y						11.75
M19	N19	N40		COL	CONC	Y						11.75
M20	N20	N41		COL	CONC	Y						11.75
M21	N21	N42		COL	CONC	Y						11.75

Company : Mitsunaga & Associates, Inc.  
 Designer : Keith Kalani  
 Job Number :

**QUAD C Existing Concrete Frame at Ground Floor**

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**Member Data (continued)**

Member Label	I Joint	J Joint	Rotate (degrees)	Shape / Section Set	Material Set	PhysEnd MemEnd	Releases TOM	End AVM	End Offsets I-End AVM	End Offsets J-End (in)	Inactive Code (in)	Length (ft)
M22	N22	N23		BEAM	CONC	Y						15.67
M23	N23	N24		BEAM	CONC	Y						20
M24	N24	N25		BEAM	CONC	Y						20
M25	N25	N26		BEAM	CONC	Y						20
M26	N26	N27		BEAM	CONC	Y						15.08
M27	N27	N28		BEAM	CONC	Y						15.58
M28	N28	N29		BEAM	CONC	Y						20
M29	N29	N30		BEAM	CONC	Y						20
M30	N30	N31		BEAM	CONC	Y						20
M31	N31	N32		BEAM	CONC	Y						15.59
M32	N32	N33		BEAM	CONC	Y						15.08
M33	N33	N34		BEAM	CONC	Y						20
M34	N34	N35		BEAM	CONC	Y						20
M35	N35	N36		BEAM	CONC	Y						20
M36	N36	N37		BEAM	CONC	Y						15.58
M37	N37	N38		BEAM	CONC	Y						15.09
M38	N38	N39		BEAM	CONC	Y						20
M39	N39	N40		BEAM	CONC	Y						20
M40	N40	N41		BEAM	CONC	Y						20
M41	N41	N42		BEAM	CONC	Y						15.66
M42	N1	N1		BEAM	CONC	Y						0

**Basic Load Case Data**

BLC No.	Basic Load Case Description	Category Code	Category Description	Gravity X	Gravity Y	Load Type Totals Joint	Load Type Totals Point	Load Type Totals Direct Dist.
1	1 KIP LOAD	None				1		

**Joint Loads/Enforced Displacements. Category : None. BLC 1 : 1 KIP LOAD**

Joint Label	[L]oad, [M]ass, or, [D]isplacement	Direction	Magnitude (k, k-ft, in, rad, k*s^2/ft)
N22	L	X	1

**Load Combinations**

Num	Description	Env	WS	PD	SRSS	CD	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	1 KIP	y				1	1	1						

**Reactions, By Combination**

LC	Joint Label	X Force (k)	Y Force (k)	Moment (k-ft)
1	N1	-.054	-.07	0
1	N2	.063	.04	0
1	N3	-.057	-.004	0
1	N4	-.055	.004	0
1	N5	-.054	-.014	0
1	N6	-.054	.003	0
1	N7	-.051	.013	0
1	N8	-.049	0	0
1	N9	-.048	.002	0
1	N10	-.047	.01	0
1	N11	-.047	-.001	0
1	N12	-.046	.013	0

### Reactions, By Combination, (continued)

LC	Joint Label	X Force (k)	Y Force (k)	Moment (k-ft)
1	N13	-.044	-.001	0
1	N14	-.043	.002	0
1	N15	-.043	-.009	0
1	N16	-.043	.001	0
1	N17	-.042	.012	0
1	N18	-.041	.002	0
1	N19	-.04	.004	0
1	N20	-.042	.025	0
1	N21	-.036	.046	0
1	Totals:	-1	0	
1	COG (ft):	NC	NC	

### Joint Displacements, By Combination

LC	Joint Label	X Translation (in)	Y Translation (in)	Rotation (radians)
1	N1	0	0	-1.008e-4
1	N2	0	0	-1.027e-4
1	N3	0	0	-9.717e-5
1	N4	0	0	-9.386e-5
1	N5	0	0	-9.103e-5
1	N6	0	0	-8.917e-5
1	N7	0	0	-8.639e-5
1	N8	0	0	-8.331e-5
1	N9	0	0	-8.093e-5
1	N10	0	0	-7.918e-5
1	N11	0	0	-7.801e-5
1	N12	0	0	-7.622e-5
1	N13	0	0	-7.416e-5
1	N14	0	0	-7.276e-5
1	N15	0	0	-7.187e-5
1	N16	0	0	-7.148e-5
1	N17	0	0	-7.044e-5
1	N18	0	0	-6.937e-5
1	N19	0	0	-6.871e-5
1	N20	0	0	-6.954e-5
1	N21	0	0	-6.606e-5
1	N22	.01	0	-1.693e-5
1	N23	.01	0	-6.095e-6
1	N24	.01	0	-9.349e-6
1	N25	.009	0	-8.527e-6
1	N26	.009	0	-7.234e-6
1	N27	.009	0	-6.07e-6
1	N28	.008	0	-7.02e-6
1	N29	.008	0	-7.634e-6
1	N30	.008	0	-7.408e-6
1	N31	.008	0	-6.41e-6
1	N32	.008	0	-5.313e-6
1	N33	.007	0	-6.062e-6
1	N34	.007	0	-6.817e-6
1	N35	.007	0	-6.654e-6
1	N36	.007	0	-5.827e-6
1	N37	.007	0	-4.867e-6
1	N38	.007	0	-5.612e-6
1	N39	.007	0	-6.316e-6
1	N40	.007	0	-6.58e-6
1	N41	.007	0	-4.177e-6

### Joint Displacements, By Combination, (continued)

LC	Joint Label	X Translation (in)	Y Translation (in)	Rotation (radians)
1	N42	.007	0	-1.102e-5

### Member Section Forces, By Combination

LC	Member Label	Section	Axial (k)	Shear (k)	Moment (k-ft)
1	M1	1	-.07	.054	0
		2	-.07	.054	-.16
		3	-.07	.054	-.32
		4	-.07	.054	-.479
		5	-.07	.054	-.639
1	M2	1	.04	.063	0
		2	.04	.063	-.184
		3	.04	.063	-.368
		4	.04	.063	-.553
		5	.04	.063	-.737
1	M3	1	-.004	.057	0
		2	-.004	.057	-.167
		3	-.004	.057	-.335
		4	-.004	.057	-.502
		5	-.004	.057	-.67
1	M4	1	.004	.055	0
		2	.004	.055	-.163
		3	.004	.055	-.326
		4	.004	.055	-.488
		5	.004	.055	-.651
1	M5	1	-.014	.054	0
		2	-.014	.054	-.16
		3	-.014	.054	-.319
		4	-.014	.054	-.479
		5	-.014	.054	-.639
1	M6	1	.003	.054	0
		2	.003	.054	-.158
		3	.003	.054	-.317
		4	.003	.054	-.475
		5	.003	.054	-.634
1	M7	1	.013	.051	0
		2	.013	.051	-.151
		3	.013	.051	-.303
		4	.013	.051	-.454
		5	.013	.051	-.605
1	M8	1	0	.049	0
		2	0	.049	-.144
		3	0	.049	-.289
		4	0	.049	-.433
		5	0	.049	-.577
1	M9	1	.002	.048	0
		2	.002	.048	-.14
		3	.002	.048	-.28
		4	.002	.048	-.42
		5	.002	.048	-.561
1	M10	1	-.01	.047	0
		2	-.01	.047	-.139
		3	-.01	.047	-.277
		4	-.01	.047	-.416
		5	-.01	.047	-.554
1	M11	1	-.001	.047	0
		2	-.001	.047	-.139

Company : Mitsunaga &amp; Associates, Inc.

Designer : Keith Kalani

Job Number :

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February 5, 2003

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**Member Section Forces, By Combination, (continued)**

LC	Member Label	Section	Axial (k)	Shear (k)	Moment (k-ft)
		3	-.001	.047	-.277
		4	-.001	.047	-.416
		5	-.001	.047	-.554
1	M12	1	.013	.046	0
		2	.013	.046	-.134
		3	.013	.046	-.267
		4	.013	.046	-.401
		5	.013	.046	-.535
1	M13	1	-.001	.044	0
		2	-.001	.044	-.126
		3	-.001	.044	-.257
		4	-.001	.044	-.385
		5	-.001	.044	-.513
1	M14	1	.002	.043	0
		2	.002	.043	-.126
		3	.002	.043	-.252
		4	.002	.043	-.378
		5	.002	.043	-.504
1	M15	1	-.009	.043	0
		2	-.009	.043	-.126
		3	-.009	.043	-.252
		4	-.009	.043	-.378
		5	-.009	.043	-.504
1	M16	1	-.001	.043	0
		2	-.001	.043	-.127
		3	-.001	.043	-.254
		4	-.001	.043	-.381
		5	-.001	.043	-.508
1	M17	1	.012	.042	0
		2	.012	.042	-.124
		3	.012	.042	-.247
		4	.012	.042	-.371
		5	.012	.042	-.494
1	M18	1	-.002	.041	0
		2	-.002	.041	-.12
		3	-.002	.041	-.24
		4	-.002	.041	-.361
		5	-.002	.041	-.481
1	M19	1	.004	.04	0
		2	.004	.04	-.118
		3	.004	.04	-.237
		4	.004	.04	-.355
		5	.004	.04	-.474
1	M20	1	-.025	.042	0
		2	-.025	.042	-.125
		3	-.025	.042	-.249
		4	-.025	.042	-.374
		5	-.025	.042	-.498
1	M21	1	.046	.036	0
		2	.046	.036	-.105
		3	.046	.036	-.21
		4	.046	.036	-.315
		5	.046	.036	-.42
1	M22	1	.946	-.07	-.639
		2	.946	-.07	-.365
		3	.946	-.07	-.09
		4	.946	-.07	.184



Company : Mitsunaga &amp; Associates, Inc.

Designer : Keith Kalani

Job Number :

QUAD C Existing Concrete Frame at Ground Floor

February 5, 2003

6:18 PM

Checked By: \_\_\_\_\_

**Member Section Forces, By Combination, (continued)**

LC	Member Label	Section	Axial (k)	Shear (k)	Moment (k-ft)
1	M23	5	.946	-.07	.458
		1	.883	-.03	-.278
		2	.883	-.03	.129
		3	.883	-.03	.021
		4	.883	-.03	.171
1	M24	5	.883	-.03	.321
		1	.826	-.034	.849
		2	.826	-.034	-.177
		3	.826	-.034	-.005
		4	.826	-.034	.166
1	M25	5	.826	-.034	.338
		1	.771	-.03	-.313
		2	.771	-.03	-.161
		3	.771	-.03	-.008
		4	.771	-.03	.144
1	M26	5	.771	-.03	.296
		1	.716	-.044	.343
		2	.716	-.044	-.177
		3	.716	-.044	-.01
		4	.716	-.044	.156
1	M27	5	.716	-.044	.323
		1	.662	-.041	-.311
		2	.662	-.041	-.151
		3	.662	-.041	.008
		4	.662	-.041	.167
1	M28	5	.662	-.041	.327
		1	.611	-.028	.279
		2	.611	-.028	-.137
		3	.611	-.028	.004
		4	.611	-.028	.145
1	M29	5	.611	-.028	.287
		1	.562	-.029	-.291
		2	.562	-.029	-.146
		3	.562	-.029	-.001
		4	.562	-.029	.143
1	M30	5	.562	-.029	.288
		1	.514	-.027	.273
		2	.514	-.027	-.14
		3	.514	-.027	-.006
		4	.514	-.027	.127
1	M31	5	.514	-.027	.26
		1	.467	-.037	-.294
		2	.467	-.037	-.152
		3	.467	-.037	-.009
		4	.467	-.037	.133
1	M32	5	.467	-.037	.276
		1	.42	-.038	-.278
		2	.42	-.038	-.136
		3	.42	-.038	.006
		4	.42	-.038	.149
1	M33	5	.42	-.038	.291
		1	.374	-.025	-.244
		2	.374	-.025	-.119
		3	.374	-.025	.005
		4	.374	-.025	.129
1	M34	5	.374	-.025	.253
		1	.33	-.026	-.26

Company : Mitsunaga &amp; Associates, Inc.

Designer : Keith Kalani

Job Number :

QUAD C Existing Concrete Frame at Ground Floor

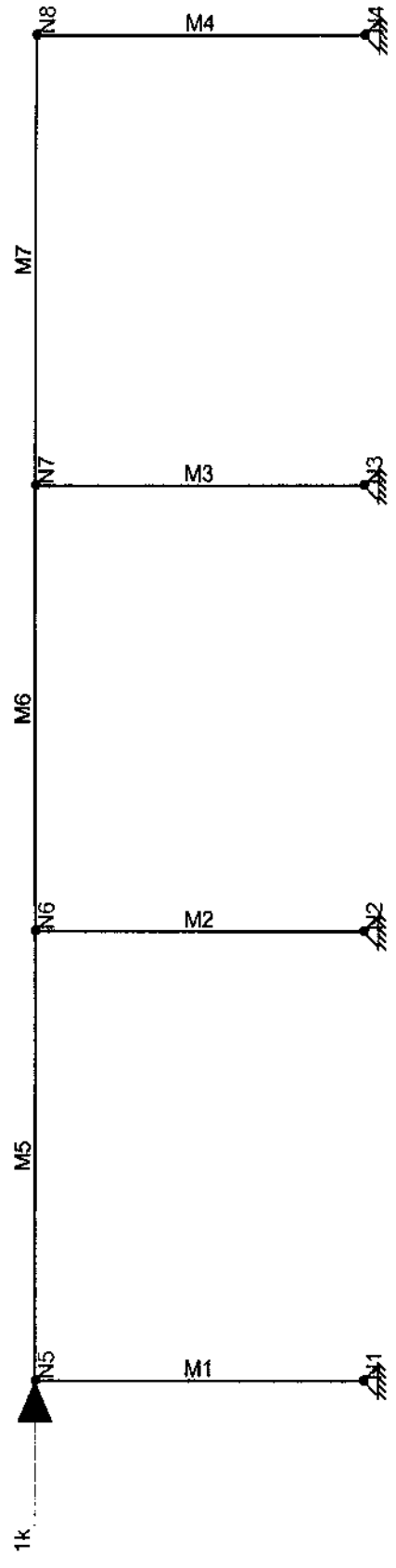
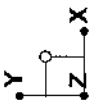
February 5, 2003

6:18 PM

Checked By: \_\_\_\_\_

**Member Section Forces, By Combination, (continued)**

LC	Member Label	Section	Axial (k)	Shear (k)	Moment (k-ft)
		2	.33	-.026	-.131
		3	.33	-.026	.001
		4	.33	-.026	.128
		5	.33	-.026	.258
1	M35	1	.287	-.024	-.246
		2	.287	-.024	.126
		3	.287	-.024	-.005
		4	.287	-.024	.115
		5	.287	-.024	.235
1	M36	1	.245	-.033	-.268
		2	.245	-.033	-.138
		3	.245	-.033	.008
		4	.245	-.033	.122
		5	.245	-.033	.252
1	M37	1	.201	-.035	-.256
		2	.201	-.035	.125
		3	.201	-.035	.006
		4	.201	-.035	.138
		5	.201	-.035	.269
1	M38	1	.159	-.023	-.226
		2	.159	-.023	-.11
		3	.159	-.023	.005
		4	.159	-.023	.12
		5	.159	-.023	.235
1	M39	1	.118	-.025	-.246
		2	.118	-.025	.122
		3	.118	-.025	.002
		4	.118	-.025	.126
		5	.118	-.025	.249
1	M40	1	.078	-.021	-.224
		2	.078	-.021	-.12
		3	.078	-.021	.018
		4	.078	-.021	.089
		5	.078	-.021	.193
1	M41	1	.036	-.046	-.305
		2	.036	-.046	.124
		3	.036	-.046	.057
		4	.036	-.046	.238
		5	.036	-.046	.42



Loads: BLC 1, LATERAL Results for LC 1, LATERAL
Mitsunaga & Associates, Inc.
Keith Kalani

QUAD C Existing Concrete Frame at 3rd Floor
10" square columns and beams

February 7, 2003
3:14 PM
QUADC-EXST.r2d

Company : Mitsunaga & Associates, Inc.  
 Designer : Keith Kalani  
 Job Number :

February 7, 2003  
 3:11 PM  
 Checked By: \_\_\_\_\_

### QUAD C Existing Concrete Frame at 3rd Floor

#### Global

Steel Code	None
Allowable Stress Increase Factor (ASIF)	1.333
Include Shear Deformation	Yes
No. of Sections for Member Calcs	5
Redesign Sections	Yes
P-Delta Analysis Tolerance	0.50%

#### Materials (General)

Material Label	Young's Modulus (ksi)	Shear Modulus (ksi)	Poisson's Ratio	Thermal Coef. (per 10 <sup>5</sup> F)	Weight Density (k/ft <sup>3</sup> )	Yield Stress (ksi)
CONC	1425	641	.16	.65	.15	2.55

#### Sections

Section Label	Database Shape	Material Label	Area (in) <sup>2</sup>	SA (0,180)	SA (90,270)	I (90,270) (in <sup>4</sup> )	I (0,180) (in <sup>4</sup> )	T/C Only
COL		CONC	100	1.2	1.2	833	833	
BEAM		CONC	100	1.2	1.2	833	833	
SEC3		CONC	1	1.2	1.2	1	1	

#### Joint Coordinates

Joint Label	X Coordinate (ft)	Y Coordinate (ft)	Joint Temperature (F)
N1	0	0	0
N2	16.42	0	0
N3	32.75	0	0
N4	49.17	0	0
N5	0	12	0
N6	16.42	12	0
N7	32.75	12	0
N8	49.17	12	0

#### Boundary Conditions

Joint Label	X Translation (k/in)	Y Translation (k/in)	Rotation (k-ft/rad)
N1	Reaction	Reaction	
N2	Reaction	Reaction	
N3	Reaction	Reaction	
N4	Reaction	Reaction	

#### Member Data

Member Label	I Joint	J Joint	Rotate (degrees)	Shape / Section Set	Material Set	Phys Memb	End Releases I-End AVM	J-End AVM	End Offsets I-End (in)	J-End (in)	Inactive Code	Length (ft)
M1	N1	N5		COL	CONC	Y						12
M2	N2	N6		COL	CONC	Y						12
M3	N3	N7		COL	CONC	Y						12
M4	N4	N8		COL	CONC	Y						12
M5	N5	N6		BEAM	CONC	Y						16.42
M6	N6	N7		BEAM	CONC	Y						16.33
M7	N7	N8		BEAM	CONC	Y						16.42

#### Basic Load Case Data

BLC No.	Basic Load Case Description	Category Code	Category Description	Gravity X	Y	Load Type Totals Joint	Point	Direct Dist.
1	LATERAL	None				1		

Company : Mitsunaga & Associates, Inc.  
 Designer : Keith Kalani  
 Job Number :

**QUAD C Existing Concrete Frame at 3rd Floor**

February 7, 2003  
 3:11 PM  
 Checked By: \_\_\_\_\_

**Joint Loads/Enforced Displacements, Category : None, BLC 1 : LATERAL**

Joint Label	[L]oad,[M]ass,or, [D]isplacement	Direction	Magnitude (k, k-ft, in, rad, k*s^2/ft)
N5	L	X	1

**Load Combinations**

Num	Description	Env	WS	PD	SRSS	CD	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	LATERAL	y				1	1	1						

**Reactions, By Combination**

LC	Joint Label	X Force (k)	Y Force (k)	Moment (k-ft)
1	N1	-208	-274	0
1	N2	.293	.088	0
1	N3	-.292	-.087	0
1	N4	.207	.272	0
1	Totals:	-1	0	
1	COG (ft):	NC	NC	

**Joint Displacements, By Combination**

LC	Joint Label	X Translation (in)	Y Translation (in)	Rotation (radians)
1	N1	0	0	-2.823e-3
1	N2	0	0	3.06e-3
1	N3	0	0	-3.053e-3
1	N4	0	0	2.805e-3
1	N5	.32	0	-1.004e-3
1	N6	.319	0	5.031e-4
1	N7	.318	0	-5.025e-4
1	N8	.318	0	-9.965e-4

**Member Section Forces, By Combination**

LC	Member Label	Section	Axial (k)	Shear (k)	Moment (k-ft)
1	M1	1	-.274	.208	0
		2	-.274	.208	-.625
		3	-.274	.208	-1.25
		4	-.274	.208	-1.875
		5	-.274	.208	-2.5
1	M2	1	.088	.293	0
		2	.088	.293	-.878
		3	.088	.293	-1.756
		4	.088	.293	-2.634
		5	.088	.293	-3.512
1	M3	1	-.087	.292	0
		2	-.087	.292	-.876
		3	-.087	.292	-1.752
		4	-.087	.292	-2.628
		5	-.087	.292	-3.504
1	M4	1	.272	.207	0
		2	.272	.207	-.621
		3	.272	.207	-1.242
		4	.272	.207	-1.864
		5	.272	.207	-2.485
1	M5	1	.792	-.274	-2.5
		2	.792	-.274	-1.375

Company : Mitsunaga & Associates, Inc.  
 Designer : Keith Kalani  
 Job Number :

QUAD C Existing Concrete Frame at 3rd Floor

February 7, 2003  
 3:11 PM  
 Checked By: \_\_\_\_\_

**Member Section Forces, By Combination, (continued)**

LC	Member Label	Section	Axial (k)	Shear (k)	Moment (k-ft)
		3	.792	-.274	-.251
		4	.792	-.274	.873
		5	.792	-.274	1.997
1	M6	1	.499	-.186	-1.515
		2	.499	-.186	-.758
		3	.499	-.186	0
		4	.499	-.186	.757
		5	.499	-.186	1.515
1	M7	1	.207	-.272	-1.989
		2	.207	-.272	.87
		3	.207	-.272	.248
		4	.207	-.272	1.366
		5	.207	-.272	2.485

# ANALYSIS OF TRANSVERSE FRAMES @ 20'-0" OC AT 3RD FLOOR

FOR MOMENT FRAMES, MOMENTS ARE  
DEFORMATION-CONTROLLED:

$$m_{ud} = \frac{Q_u}{Q_E} = Q_E \quad \dots \dots \text{FEMA 310 Eq (4-8)}$$

0 (load directly to columns)

Expected Strength

$$m_{ce} \geq m_{ud}/m$$

where  $m = 3$  for  $v \leq 3\sqrt{f'_c}$ , Immediate Occupancy  
2.5 for  $v > 3\sqrt{f'_c}$

FOR MOMENT FRAMES, AXIAL AND SHEAR  
FORCES ARE FORCE-CONTROLLED:

$$\begin{aligned} P_{uf} &= P_0 \pm P_E/CJ \quad \dots \dots \text{FEMA 310 Eq (4-9)} \\ \text{and } V_{uf} &= V_0 \pm V_E/CJ \end{aligned}$$

(load supported on columns)

where  $C = 1.3$  for 1-story conc. frame  
(3rd floor only)

$$J = 1.5 + S_{DS}^{0.6} = 2.1, \text{ use } 2.0 \text{ for IO}$$

$$\begin{aligned} P_0 &= \left( \frac{1.1}{1.1} \right) \left( \begin{aligned} &.0175 \\ &.020 \times 25\% \end{aligned} \right) (16.38 \times 20) \\ &\quad + 1.1 \times .150 \times (0.83)^2 (6 + 20) \\ &= 11.1 \text{ K} \end{aligned}$$

(col. 6m)

DESCRIPTION

Mitsunaga &amp; Associates, Inc.

BY:

CHECKED

PROJECT:

QVAD C

JOB NO.

SHEET

DATE

OF

# ANALYSIS OF TRANSVERSE FRAMES & 20'-0" AC AT 3RD FLOOR

## BEAM CHECK (10" x 10")

For a 1 kip lateral load,  $m_{max} = 2.5^{1-k}$   
(See RISA-2D Output)

$$V_{max} = 0.27^k$$

Seismic force at roof,  $F_{roof} = 1787.5^k$

Load to frame based on  
trib. area of flexible  
diaphragm

$$= 1787.5 \times 20/364$$

$$= 98.2^k$$

$$m_{ud}/m = (2.5 \times 98.2) / 2.5 = 98.2^{1-k}$$

check m:

$$V / bwd\sqrt{f'_c} = (0.27 \times 98.2) / (10 \times 7.5 \sqrt{2500})$$

$$= 6.3 > 6, m = 2.5 \text{ OK}$$

For 10" x 10" beam w/ 3-#4

$$b = 10"$$

$$d = 7.5"$$

$$f_y = 1.25 \times 40 = 50 \text{ ksi}$$

$$f'_c = 1.25 \times 2.5 = 3.1 \text{ ksi}$$

$$a = \frac{A_s f_y}{0.85 f'_c b} = 1.14"$$

$$M_{CE} = A_s f_y (d - a/2) = 208^{11-k}$$

$$= 17.3^{1-k} < M_{ud}/m$$

$\therefore$  BEAM OVERSTRESSED IN FLEXURE

DESCRIPTION

Mitsunaga & Associates, Inc.

BY:

CHECKED

PROJECT:

QVADC

JOB NO.

SHEET

DATE

OF



# ANALYSIS OF TRANSVERSE FRAMES @ 20'0"oc AT 3RD FLOOR

## BEAM CHECK (cont.)

$$V_E/CJ = (0.27 \times 98.2) / (1.3 \times 2) = 10.2k$$

For 10" x 10" beam w/ 1/4" d stirrups @ 6"oc

$$b = 10"$$

$$d = 7.5"$$

$$V_{uc} = 2 \sqrt{3100} (10 \times 7.5) = 8.4k$$

$$V_{us} = 0 \quad (\text{spacing} > d/2)$$

$$V_{up} = 8.4k < 10.2k \text{ NB}$$

∴ BEAM OVERSTRESSED IN SHEAR

DESCRIPTION	<b>Mitsunaga &amp; Associates, Inc.</b>		BY:	CHECKED
	PROJECT: <u>QUAD C</u>		JOB NO.	SHEET
			DATE	OF

# ANALYSIS OF TRANSVERSE FRAMES @ 20'-0" @ AT 3RD FLOOR

## COLUMN CHECK (10" x 10")

For a 1 kip lateral load,  $M_{max} = 3.5 \text{ k}$   
(See RISA-2D Output)  $V_{max} = 0.29 \text{ k}$   
 $P_{E_{max}} = 0.27 \text{ k}$

Seismic force at roof,  $F_{roof} = 1787.5 \text{ k}$

Load to frame based on  
trib. area of flexible  
diaphragm

$$= 1787.5 \times 20 / 364$$

$$= 98.2 \text{ k}$$

$$M_u / m = (3.5 \times 98.2) / 2.5 = 137 \text{ k}$$

$$P_E / C_J = (0.27 \times 98.2) / (1.3 \times 2) = 10.2 \text{ k}$$

$$P_u = 0.85 \left[ 0.85 f'_c \left( A_g \right) \right] = 226 \text{ k} > P_D + P_E$$

(1.1) (10.2)  
CJ

(2.5 x 18) 10 x 10  
no contribution from  
reinf. since ties  
spaced @ 12" oc

∴ COLUMN OK, FOR AXIAL LOADS

For 10" x 10" column w/ 2-#4 E.F.

∴ COLUMN OVERSTRESSED IN FLEXURE  
(SEE BEAM CHECK)

DESCRIPTION

Mitsunaga &amp; Associates, Inc.

BY:

CHECKED

PROJECT:

QUAD C

JOB NO.

SHEET

DATE

OF

# ANALYSIS OF TRANSVERSE FRAMES @ 20'-0" OC AT 3RD FLOOR

## COLUMN CHECK (CONT.)

$$V_E/CJ = (0.29 \times 98.2) / (1.3 \times 2) = 11.0k$$

For 10" x 10" column w/ 1/4" ties @ 12" oc

$$b = 10"$$

$$d = 7.5"$$

$$V_{uc} = 2 \sqrt{2500 \times 1.25} (10 \times 7.5) = 8.4k$$

$$V_{us} = 0 \quad (\text{spacing} > d/2)$$

$$V_{uf} = 8.4k < 11.0k \quad \text{NO}$$

∴ COLUMN OVERSTRESSED IN SHEAR

DESCRIPTION	<b>Mitsunaga &amp; Associates, Inc.</b>		BY:	CHECKED
	PROJECT: <u>QLAD C</u>		JOB NO.	SHEET
			DATE	OF

PROJ: SCHOFIELD BARRACKS, QUAD C  
TITLE: DESIGN LOADS

DATE: 04/20 2002  
TIME: 15:17 P.M.

## TYPICAL FLOOR:

RISE/12 =	0	FACTOR =	1.00
	WEIGHT (psf)	SLOPE FACTOR	WEIGHT (psf)
6" THK CONC	75	1.00	75.00
PARTITION	20	1.00	20.00
CEILING	3	1.00	3.00
MECH/MISC	3	1.00	3.00
TOTAL DEAD LOAD			101.00
TOTAL LIVE LOAD	50	1.00	50.00
TOTAL LOAD			151.00

## TYPICAL BALCONY:

RISE/12 =	0	FACTOR =	1.00
	WEIGHT (psf)	SLOPE FACTOR	WEIGHT (psf)
6" THK CONC	75	1.00	75.00
PARTITION	0	1.00	0.00
CEILING	0	1.00	0.00
MECH/MISC	3	1.00	3.00
TOTAL DEAD LOAD			78.00
TOTAL LIVE LOAD	100	1.00	100.00
TOTAL LOAD			178.00

PROJ: SCHOFIELD BARRACKS, QUAD C  
TITLE: DESIGN LOADS

DATE: 04/20 2002  
TIME: 15:17 P.M.

## TYPICAL ROOF:

RISE/12 = 0.5 FACTOR = 1.00

	WEIGHT (psf)	SLOPE FACTOR	WEIGHT (psf)
TAR & GRAVEL	6	1.00	6.01
2x DECKING	4.5	1.00	4.50
2x8 @ 16 RAFTERS	2	1.00	2.00
2x8 @ 16 JOISTS	2	1.00	2.00
TRUSSES @ 20 FT	1.5	1.00	1.50
CEILING	3	1.00	3.00
MECH/MISC	5	1.00	5.00
TOTAL DEAD LOAD			24.02
TOTAL LIVE LOAD	20	1.00	20.00
TOTAL LOAD			44.02

TIER 2 FULL BUILDING EVALUATION

PAGE 1

PROJ: QUAD C DATE: 05-Feb 2003  
TITLE: TYPICAL BUILDING (w/o Retrofit) TIME: 04:02 PM P.M.

$$V = C \cdot S_a \cdot W$$

$$T = C_t \cdot (h_n)^{3/4}$$

$$S_{xs} = 2/3 \cdot F_a \cdot S_s$$

$$S_{x1} = 2/3 \cdot F_v \cdot S_1$$

$$T_0 = (S_{x1} \cdot B_s / S_{xs} \cdot B_1)$$

SHORT PERIOD SPECTRAL RESPONSE ACCELERATION PARAMETER,  $S_s = 0.60$   
SPECTRAL RESPONSE ACCELERATION PARAMETER AT 1 SEC,  $S_1 = 0.17$

PERFORMANCE LEVEL [IO,SE,LS,CP] = IO  $B_s = 1.00$   
SOIL CLASS [A, B, C, D, E, F] = E  $B_1 = 1.00$   
% DAMPING = 5.000  $T_0 = 0.65$   
SITE COEFFICIENT,  $F_a = 1.5$   $C_1 = 1.31$   
SITE COEFFICIENT,  $F_v = 3.4$   $C_2 = 1.00$   
Ct FACTOR [0.035,0.030,0.020,0.060] = 0.020  $C_3 = 1.00$   
C FACTOR [1.0,1.1,1.2,1.3,1.4] = 1.1  $m = 0.00$

DESIGN SHORT PERIOD RESPONSE ACCELERATION PARAMETER,  $S_{xs} = 0.60$   
DESIGN RESPONSE ACCELERATION PARAMETER AT 1 SEC,  $S_{x1} = 0.39$

RESPONSE SPECTRAL ACCELERATION (AT PERIOD T),  $S_a = 0.60$

TOTAL BUILDING HEIGHT = 37.74 FT  
BUILDING SEISMIC WEIGHT, W = 8325 KIPS

	T (SEC)	k	BASE V (KIPS)
TIER 2 EVALUATION	0.30	1.00	5494.50

BASE SHEAR COEFFICIENT = 0.6600 x W  
TOTAL DESIGN BASE SHEAR = 5494.5 KIPS

Ct	LATERAL SYSTEM	%damping	Bs	B1
0.035	Steel Moment Resisting Frames	2.00	0.80	0.80
0.030	RC Moment Resisting Frames	5.00	1.00	1.00
0.030	Eccentrically Braced Frames	10.00	1.20	1.20
0.020	All Oher Buildings			
0.060	Wood Buildings			

## TIER 2 FULL BUILDING EVALUATION

PAGE 2

PROJ: QUAD C DATE: 05-Feb 2003  
 TITLE: TYPICAL BUILDING (w/o Retrofit) TIME: 04:02 PM P.M.

CLASS SITE DESCRIPTION - SOIL PROFILES

A HARD ROCK, SHEAR WAVE VELOCITY  $V_s > 5000$  FT/S.  
 B ROCK, SHEAR WAVE VELOCITY  $V_s$  FROM 2500 TO 5000 FT/S.  
 C VERY DENSE SOIL AND SOFT ROCK, SHEAR WAVE VELOCITY  
 $V_s$  FROM 1200 TO 2500 FT/S.  
 D STIFF SOIL, SHEAR WAVE VELOCITY  $V_s$  FROM 600 TO 1200 FT/S.  
 E SOFT SOIL, SHEAR WAVE VELOCITY  $V_s < 600$  FT/S.  
 (ASSUME CLASS E IF NO INFORMATION IS AVAILABLE.)  
 F SOIL REQUIRING SITE-SPECIFIC EVALUATION.

SITE COEFFICIENT,  $F_a$  (Based on Site Class & Spectral Response Acceleration  $S_s$ )

CLASS	SPECTRAL RESPONSE ACCELERATION, $S_s$				
	0.25	0.50	0.75	1.00	1.25
A	0.80	0.80	0.80	0.80	0.80
B	1.00	1.00	1.00	1.00	1.00
C	1.20	1.20	1.10	1.00	1.00
D	1.60	1.40	1.20	1.10	1.00
E	2.50	1.70	1.20	0.90	NA
F	NA	NA	NA	NA	NA

SITE COEFFICIENT,  $F_v$  (Based on Site Class & Spectral Response Acceleration  $S_1$ )

CLASS	SPECTRAL RESPONSE ACCELERATION, $S_1$				
	0.10	0.20	0.30	0.40	0.50
A	0.80	0.80	0.80	0.80	0.80
B	1.00	1.00	1.00	1.00	1.00
C	1.70	1.60	1.50	1.40	1.30
D	2.40	2.00	1.80	1.60	1.50
E	3.50	3.40	2.80	2.40	2.20
F	NA	NA	NA	NA	NA

## TIER 2 FULL BUILDING EVALUATION

PAGE 3

PROJ: QUAD C  
 TITLE: TYPICAL BUILDING (w/o Retrofit)

DATE: 06-Feb 2003  
 TIME: 07:26 AM A.M.

INCH-POUND UNITS:

LEVEL	WEIGHT (kips)	DH (ft)	HEIGHT (ft)	WxH (kips-ft)	FORCE (kips)	SHEAR (kips)	DIAPH Fp (kips)
	0	0.0	0.0	0.00	0.0	0.0	0.00
	0	0.0	0.0	0.00	0.0	0.0	0.00
ROOF	1606	12.6	37.7	60610.44	1787.5	1787.5	1624.98
3RD	3273	12.6	25.2	82348.68	2428.6	4216.0	2571.15
2ND	3446	12.6	12.6	43350.68	1278.5	5494.5	2067.60
GRND							
	8325	37.7		186309.8	5494.5		



## SEISMIC WEIGHT DETERMINATION

PAGE 1

PROJECT: QUAD C -- TYPICAL BUILDING  
 TITLE: ROOF  
 DATE: 02/05/03  
 TIME: 03:58 PM

FLOORS: (ROOF)	DESCRIPTION	WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (klps)
	ROOF	0.024	25054	601.30
		0.000	0	0.00
		0.000	0	0.00
		0.000	0	0.00
				601.30

BEAMS: (ROOF)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (klps)
GRID A	6.50	70.00	0.474	364.00	1.00	172.52
GRID B	8.00	10.00	0.083	364.00	1.00	30.33
GRID C	10.00	10.00	0.104	364.00	1.00	37.92
GRID D	10.00	10.00	0.104	364.00	1.00	37.92
GRID E	6.50	70.00	0.474	364.00	1.00	172.52
TRANS	10.00	10.00	0.104	80.83	19.00	120.39
GRID 1, 21	6.50	70.00	0.474	50.00	2.00	47.40
						619.00

COLUMNS: (ROOF)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (klps)
GRID A	10.00	48.00	0.500	5.58	8.00	22.32
GRID C	10.00	10.00	0.104	5.58	19.00	11.04
GRID D	10.00	10.00	0.104	5.58	19.00	11.04
GRID E	4.00	10.00	0.042	5.58	19.00	4.42
GRID B	4.00	10.00	0.042	5.58	19.00	4.42
	0.00	0.00	0.000	0.00	0.00	0.00
						53.24

WALLS: (ROOF)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (klps)
GRID B	4.89	150.00	0.059	364.00	5.58	119.07
GRID E	4.64	150.00	0.058	364.00	5.58	117.80
GRID A	8.00	150.00	0.100	34.83	5.58	19.44
GRID 1	8.00	150.00	0.100	50.00	5.58	27.90
GRID 21	8.00	150.00	0.100	50.00	5.58	27.90
GRID 6	2.00	150.00	0.025	50.00	5.58	6.98
GRID 11	2.00	150.00	0.025	50.00	5.58	6.98
GRID 16	2.00	150.00	0.025	50.00	5.58	6.98
	0.00	150.00	0.000	0.00	5.58	0.00
						333.04

FLOORS	601.30 klps
BEAMS	619.00 klps
COLUMNS	53.24 klps
WALLS	333.04 klps
	1606.58 klps

## SEISMIC WEIGHT DETERMINATION

PAGE 2

PROJECT:	QUAD C -- TYPICAL BUILDING				DATE:	02/05/03
TITLE:	3RD FL				TIME:	03:58 PM
FLOORS: (3RD FL)	DESCRIPTION	WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (kips)		
	TYPICAL FLOOR	0.101	18200	1838.20		
	BALCONY	0.078	3942	307.49		
	STAIRS (add to balcony)	0.092	253	23.26		
	STAIRS (add to balcony)	0.092	217	19.93		
				2188.87		
BEAMS: (3RD FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	6.00	27.00	0.169	364.00	1.00	61.43
GRID C	12.00	14.00	0.175	364.00	1.00	63.70
GRID D	12.00	14.00	0.175	364.00	1.00	63.70
	0.00	0.00	0.000	0.00	0.00	0.00
	0.00	0.00	0.000	0.00	0.00	0.00
						188.83
COLUMNS: (3RD FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	10.00	48.00	0.500	5.58	8.00	22.32
GRID C	10.00	10.00	0.104	5.58	19.00	11.04
GRID D	10.00	10.00	0.104	5.58	19.00	11.04
GRID E	4.00	10.00	0.042	5.58	19.00	4.42
GRID B	4.00	10.00	0.042	5.58	19.00	4.42
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	12.00	0.050	6.04	19.00	5.74
GRID B	4.00	12.00	0.050	6.04	19.00	5.74
						116.52
WALLS: (3RD FL)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (kips)
GRID B	4.69	150.00	0.059	364.00	5.58	119.07
GRID E	4.64	150.00	0.058	364.00	5.58	117.80
GRID A	8.00	150.00	0.100	34.83	5.58	19.44
GRID 1	8.00	150.00	0.100	50.00	5.58	27.90
GRID 21	8.00	150.00	0.100	50.00	5.58	27.90
GRID 6	2.00	150.00	0.025	50.00	5.58	6.98
GRID 11	2.00	150.00	0.025	50.00	5.58	6.98
GRID 16	2.00	150.00	0.025	50.00	5.58	6.98
	0.00	150.00	0.000	0.00	0.00	0.00
GRID B	6.26	150.00	0.078	364.00	6.04	172.04
GRID E	6.18	150.00	0.077	364.00	6.04	169.84
GRID A	8.00	150.00	0.100	34.83	6.04	21.04
GRID 1	8.00	150.00	0.100	50.00	6.04	30.20
GRID 21	8.00	150.00	0.100	50.00	6.04	30.20
GRID 6	2.00	150.00	0.025	50.00	6.04	7.55
GRID 11	2.00	150.00	0.025	50.00	6.04	7.55
GRID 16	2.00	150.00	0.025	50.00	6.04	7.55
	0.00	150.00	0.000	0.00	0.00	0.00
	0.00	150.00	0.000	0.00	0.00	0.00
						779.00
FLOORS	2188.87 kips					
BEAMS	188.83 kips					
COLUMNS	116.52 kips					
WALLS	779.00 kips					
	3273.22 kips					

## SEISMIC WEIGHT DETERMINATION

PAGE 3

PROJECT: QUAD C -- TYPICAL BUILDING DATE: 02/05/03  
 TITLE: 2ND FL TIME: 03:58 PM

FLOORS: (2ND FL)	DESCRIPTION	WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (klps)
	TYPICAL FLOOR	0.101	18200	1838.20
	BALCONY	0.078	3942	307.49
	STAIRS (add to balcony)	0.092	253	23.26
	STAIRS (add to balcony)	0.092	217	19.93
				2188.87

BEAMS: (2ND FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (klps)
GRID A	6.00	27.00	0.169	364.00	1.00	61.43
GRID C	12.00	14.00	0.175	364.00	1.00	63.70
GRID D	12.00	14.00	0.175	364.00	1.00	63.70
	0.00	0.00	0.000	0.00	0.00	0.00
	0.00	0.00	0.000	0.00	0.00	0.00
						188.83

COLUMNS: (2ND FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (klps)
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	12.00	0.050	6.04	19.00	5.74
GRID B	4.00	12.00	0.050	6.04	19.00	5.74
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	14.00	14.00	0.204	5.46	19.00	21.18
GRID D	14.00	14.00	0.204	5.46	19.00	21.18
GRID E	6.00	14.00	0.088	6.04	19.00	10.04
GRID B	6.00	14.00	0.088	6.04	19.00	10.04
	0.00	0.00	0.000	0.00	0.00	0.00
						146.40

WALLS: (2ND FL)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (klps)
GRID B	6.26	150.00	0.078	364.00	6.04	172.04
GRID E	6.18	150.00	0.077	364.00	6.04	169.84
GRID A	8.00	150.00	0.100	34.83	6.04	21.04
GRID 1	8.00	150.00	0.100	50.00	6.04	30.20
GRID 21	8.00	150.00	0.100	50.00	6.04	30.20
GRID 6	2.00	150.00	0.025	50.00	6.04	7.55
GRID 11	2.00	150.00	0.025	50.00	6.04	7.55
GRID 16	2.00	150.00	0.025	50.00	6.04	7.55
	0.00	150.00	0.000	0.00	0.00	0.00
GRID B	6.79	150.00	0.085	364.00	6.04	186.60
GRID E	6.74	150.00	0.084	364.00	6.04	185.23
GRID A	8.00	150.00	0.100	34.83	6.04	21.04
GRID 1	8.00	150.00	0.100	50.00	6.04	30.20
GRID 21	8.00	150.00	0.100	50.00	6.04	30.20
GRID 6	2.00	150.00	0.025	50.00	6.04	7.55
GRID 11	2.00	150.00	0.025	50.00	6.04	7.55
GRID 16	2.00	150.00	0.025	50.00	6.04	7.55
	0.00	150.00	0.000	0.00	0.00	0.00
	0.00	150.00	0.000	0.00	0.00	0.00
						921.88

FLOORS	2188.87 klps
BEAMS	188.83 klps
COLUMNS	146.40 klps
WALLS	921.88 klps

3445.98 klps

## CENTER OF MASS DETERMINATION

PAGE 1

PROJECT: QUAD C -- TYPICAL BUILDING  
 TITLE: ROOF

DATE: 02/05/03  
 TIME: 03:58 PM

FLOORS: (ROOF)	DESCRIPTION	WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	ROOF	601.30	182.00	30.42	109436	18289
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

109436 18289

BEAMS: (ROOF)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	172.52	182.00	60.42	31399	10424
	GRID B	30.33	182.00	49.58	5521	1504
	GRID C	37.92	182.00	33.17	6901	1258
	GRID D	37.92	182.00	16.83	6901	638
	GRID E	172.52	182.00	0.42	31399	72
	TRANS	120.39	182.00	30.42	21911	3662
	GRID 1, 21	47.40	182.00	30.42	8626	1442

112657 19000

COLUMNS: (ROOF)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	22.32	182.00	60.42	4062	1349
	GRID C	11.04	182.00	33.17	2010	366
	GRID D	11.04	182.00	16.83	2010	186
	GRID E	4.42	182.00	0.67	804	3
	GRID B	4.42	182.00	49.33	804	218
		0.00	0.00	0.00	0	0

9690 2122

WALLS: (ROOF)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID B	119.07	182.00	49.67	21672	5914
	GRID E	117.80	182.00	0.33	21441	39
	GRID A	19.44	182.00	60.50	3537	1176
	GRID 1	27.90	182.00	25.00	5078	698
	GRID 21	27.90	182.00	25.00	5078	698
	GRID 8	6.98	182.00	25.00	1269	174
	GRID 11	6.98	182.00	25.00	1269	174
	GRID 16	6.98	182.00	25.00	1269	174
		0.00	0.00	0.00	0	0

WEIGHTX WEIGHTY

60613 9047

FLOORS	109436	18289	CENTER OF MASS X =	182.00
BEAMS	112657	19000	CENTER OF MASS Y =	30.16
COLUMNS	9690	2122		
WALLS	60613	9047		

292397.15 48457.45

## CENTER OF MASS DETERMINATION

PAGE 2

PROJECT: QUAD C -- TYPICAL BUILDING  
 TITLE: 3RD FL

DATE: 02/05/03  
 TIME: 03:58 PM

FLOORS: (3RD FL)	DESCRIPTION	WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	TYPICAL FLOOR	1838.20	182.00	25.00	334552	45955
	BALCONY	307.49	182.00	55.42	55962	17039
	STAIRS (add to balcony)	23.26	182.00	55.42	4232	1289
	STAIRS (add to balcony)	19.93	131.67	58.12	2624	1158

397371 65441

BEAMS: (3RD FL)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	61.43	182.00	60.42	11179	3711
	GRID C	63.70	182.00	33.17	11593	2113
	GRID D	63.70	182.00	16.83	11593	1072
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

34366 6896

COLUMNS: (3RD FL)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	22.32	182.00	60.42	4082	1349
	GRID C	11.04	182.00	33.17	2010	366
	GRID D	11.04	182.00	16.83	2010	186
	GRID E	4.42	182.00	0.67	804	3
	GRID B	4.42	182.00	49.33	804	218
	GRID A	20.68	182.00	60.42	3764	1249
	GRID C	15.56	182.00	33.17	2832	516
	GRID D	15.56	182.00	16.83	2832	282
	GRID E	5.74	182.00	0.67	1044	4
	GRID B	5.74	182.00	49.33	1044	283

21207 4436

WALLS: (3RD FL)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID B	119.07	182.00	49.67	21672	5914
	GRID E	117.80	182.00	0.33	21441	39
	GRID A	19.44	182.00	60.50	3537	1176
	GRID 1	27.90	182.00	25.00	5078	698
	GRID 21	27.90	182.00	25.00	5078	698
	GRID 6	6.98	182.00	25.00	1269	174
	GRID 11	6.98	182.00	25.00	1269	174
	GRID 16	6.98	182.00	25.00	1269	174
		0.00	0.00	0.00	0	0
	GRID B	172.04	182.00	49.67	31311	8545
	GRID E	169.84	182.00	0.33	30911	56
	GRID A	21.04	182.00	60.50	3829	1273
	GRID 1	30.20	182.00	25.00	5496	755
	GRID 21	30.20	182.00	25.00	5496	755
	GRID 6	7.55	182.00	25.00	1374	189
	GRID 11	7.55	182.00	25.00	1374	189
	GRID 16	7.55	182.00	25.00	1374	189
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

WEIGHTX WEIGHTY

141779 20997

FLOORS	397371	65441
BEAMS	34366	6896
COLUMNS	21207	4436
WALLS	141779	20997

594722.38 97770.97

CENTER OF MASS X = 181.69  
 CENTER OF MASS Y = 29.87

Total center of mass X = 181.79  
 Total center of mass Y = 29.97

## CENTER OF MASS DETERMINATION

PAGE 3

PROJECT: QUAD C - TYPICAL BUILDING  
TITLE: 2ND FL

DATE: 02/05/03  
TIME: 03:58 PM

FLOORS: (2ND FL)	DESCRIPTION	WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	TYPICAL FLOOR	1838.20	182.00	25.00	334552	45955
	BALCONY	307.49	182.00	55.42	55962	17039
	STAIRS (add to balcony)	23.26	182.00	55.42	4232	1289
	STAIRS (add to balcony)	19.83	131.67	58.12	2624	1158

397371 65441

BEAMS: (2ND FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	61.43	182.00	60.42	11179	3711
	GRID C	63.70	182.00	33.17	11593	2113
	GRID D	63.70	182.00	16.83	11593	1072
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

34366 6896

COLUMNS: (2ND FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	20.68	182.00	60.42	3764	1249
	GRID C	15.56	182.00	33.17	2832	516
	GRID D	15.56	182.00	16.83	2832	262
	GRID E	5.74	182.00	0.67	1044	4
	GRID B	5.74	182.00	49.33	1044	283
	GRID A	20.68	182.00	60.42	3764	1249
	GRID C	21.18	182.00	33.17	3855	703
	GRID D	21.18	182.00	16.83	3855	356
	GRID E	10.04	182.00	0.67	1828	7
	GRID B	10.04	182.00	49.33	1828	495
		0.00	0.00	0.00	0	0

26645 5125

WALLS: (2ND FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID B	172.04	182.00	49.67	31311	8545
	GRID E	169.84	182.00	0.33	30911	56
	GRID A	21.04	182.00	60.50	3829	1273
	GRID 1	30.20	182.00	25.00	5496	755
	GRID 21	30.20	182.00	25.00	5496	755
	GRID 6	7.55	182.00	25.00	1374	189
	GRID 11	7.55	182.00	25.00	1374	189
	GRID 16	7.55	182.00	25.00	1374	189
		0.00	0.00	0.00	0	0
	GRID B	186.60	182.00	49.67	33962	9269
	GRID E	185.23	182.00	0.33	33712	61
	GRID A	21.04	182.00	60.50	3829	1273
	GRID 1	30.20	182.00	25.00	5496	755
	GRID 21	30.20	182.00	25.00	5496	755
	GRID 6	7.55	182.00	25.00	1374	189
	GRID 11	7.55	182.00	25.00	1374	189
	GRID 16	7.55	182.00	25.00	1374	189
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

WEIGHTX WEIGHTY

167783 24629

FLOORS	397371	65441
BEAMS	34366	6896
COLUMNS	26645	5125
WALLS	167783	24629

CENTER OF MASS X = 181.71  
CENTER OF MASS Y = 29.63

Total center of mass X = 181.76  
Total center of mass Y = 29.83

626164.75 102091.35

## Rigid Diaphragm Torsional Analysis

Description QUAD C, TYPICAL BUILDING -- 2ND FLOOR DIAPHRAGM

## General Information

Y-Y Axis Shear	5,494.50 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	181.76 ft
X-X Axis Shear	5,494.50 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	29.83 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	5.480	363.330	12.580	181.670	50.000	0.0	Fix-Fix	1.0
2	5.690	363.330	12.580	181.670	0.000	0.0	Fix-Fix	1.0
3	8.000	50.000	12.580	0.000	25.000	90.0	Fix-Fix	1.0
4	8.000	50.000	12.580	363.330	25.000	90.0	Fix-Fix	1.0
5	2.000	50.000	12.580	90.750	25.000	90.0	Fix-Fix	1.0
6	2.000	50.000	12.580	181.920	25.000	90.0	Fix-Fix	1.0
7	2.000	50.000	12.580	272.580	25.000	90.0	Fix-Fix	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	8.341	2,691.602	77.606	2,769.208
2	8.341	2,794.747	-77.611	2,794.747
3	-18.094	1,971.159	235.737	2,208.897
4	18.239	1,971.159	237.555	2,208.714
5	-18.094	492.790	29.498	522.287
6	18.239	492.790	0.076	492.866
7	18.239	492.790	29.718	522.507

## Summary

X Distance to Center of Rigidity	181.688 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear	
Y Distance to Center of Rigidity	24.531 ft	Xcm + .05*Max-X - X-cr =	18.239 ft Torsion = 100211.78 k-ft
		Xcm - .05*Max-X - X-cr =	-18.094 ft Torsion = -99,419.89 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear	
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr =	8.341 ft Torsion = 45,828.59 k-ft
		Ycm - .05*Max-Y - Y-cr =	2.258 ft Torsion = 12,405.55 k-ft

## Rigid Diaphragm Torsional Analysis

Description QUAD C, TYPICAL BUILDING -- 3RD FLOOR DIAPHRAGM

## General Information

Y-Y Axis Shear	4,216.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	181.79 ft
X-X Axis Shear	4,216.00 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	29.97 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	4.500	363.330	12.580	181.670	50.000	0.0	Fix-Fix	1.0
2	4.510	363.330	12.580	181.670	0.000	0.0	Fix-Fix	1.0
3	8.000	50.000	12.580	0.000	25.000	90.0	Fix-Fix	1.0
4	8.000	50.000	12.580	363.330	25.000	90.0	Fix-Fix	1.0
5	2.000	50.000	12.580	90.750	25.000	90.0	Fix-Fix	1.0
6	2.000	50.000	12.580	181.920	25.000	90.0	Fix-Fix	1.0
7	2.000	50.000	12.580	272.580	25.000	90.0	Fix-Fix	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	8.039	2,101.789	47.084	2,148.873
2	8.039	2,106.460	-47.084	2,106.460
3	-18.065	1,522.210	183.587	1,705.797
4	18.268	1,522.210	185.612	1,707.822
5	-18.065	380.553	22.972	403.525
6	18.268	380.553	0.059	380.612
7	18.268	380.553	23.220	403.772

## Summary

X Distance to Center of Rigidity	181.688 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear	
Y Distance to Center of Rigidity	24.972 ft	Xcm + .05*Max-X - X-cr =	18.268 ft Torsion = 77,019.77 k-ft
		Xcm - .05*Max-X - X-cr =	-18.065 ft Torsion = -76,180.15 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear	
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr =	8.039 ft Torsion = 33,893.25 k-ft
		Ycm - .05*Max-Y - Y-cr =	1.956 ft Torsion = 8,247.32 k-ft



## Rigid Diaphragm Torsional Analysis

Description QUAD C, TYPICAL BUILDING -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

## General Information

Y-Y Axis Shear	0.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	182.00 ft
X-X Axis Shear	1,787.50 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	30.16 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	3.380	363.330	12.580	181.670	50.000	0.0	Fix-Pin	1.0
2	3.390	363.330	12.580	181.670	0.000	0.0	Fix-Pin	1.0
3	6.000	50.000	12.580	0.000	25.000	90.0	Fix-Pin	1.0
4	6.000	50.000	12.580	363.330	25.000	90.0	Fix-Pin	1.0
5	0.500	20.000	12.580	15.670	25.000	90.0	Fix-Pin	1.0
6	0.500	20.000	12.580	35.670	25.000	90.0	Fix-Pin	1.0
7	0.500	20.000	12.580	55.670	25.000	90.0	Fix-Pin	1.0
8	0.500	20.000	12.580	75.670	25.000	90.0	Fix-Pin	1.0
9	0.500	20.000	12.580	90.750	25.000	90.0	Fix-Pin	1.0
10	0.500	20.000	12.580	106.330	25.000	90.0	Fix-Pin	1.0
11	0.500	20.000	12.580	126.330	25.000	90.0	Fix-Pin	1.0
12	0.500	20.000	12.580	146.330	25.000	90.0	Fix-Pin	1.0
13	0.500	20.000	12.580	166.330	25.000	90.0	Fix-Pin	1.0
14	0.500	20.000	12.580	181.920	25.000	90.0	Fix-Pin	1.0
15	0.500	20.000	12.580	197.000	25.000	90.0	Fix-Pin	1.0
16	0.500	20.000	12.580	217.000	25.000	90.0	Fix-Pin	1.0
17	0.500	20.000	12.580	237.000	25.000	90.0	Fix-Pin	1.0
18	0.500	20.000	12.580	257.000	25.000	90.0	Fix-Pin	1.0
19	0.500	20.000	12.580	272.580	25.000	90.0	Fix-Pin	1.0
20	0.500	20.000	12.580	287.660	25.000	90.0	Fix-Pin	1.0
21	0.500	20.000	12.580	307.660	25.000	90.0	Fix-Pin	1.0
22	0.500	20.000	12.580	327.660	25.000	90.0	Fix-Pin	1.0
23	0.500	20.000	12.580	347.660	25.000	90.0	Fix-Pin	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	8.238	892.202	21.746	913.948
2	8.238	894.842	-21.746	894.842
3	8.238	0.227	35.009	35.236
4	8.238	0.227	35.008	35.235
5	8.238	0.000	0.735	0.735
6	8.238	0.000	0.647	0.647
7	8.238	0.000	0.558	0.558
8	8.238	0.000	0.469	0.470
9	8.238	0.000	0.403	0.403
10	8.238	0.000	0.334	0.334
11	8.238	0.000	0.245	0.245
12	8.238	0.000	0.156	0.157
13	8.238	0.000	0.068	0.068

Title : QUAD C

Job #

A036

Dsgnr:

Date:

Description : Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d

Scope : Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.

Rev: 506001

## Rigid Diaphragm Torsional Analysis

Page 2

## Description QUAD C, TYPICAL BUILDING -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

14	8.238	0.000	0.001	0.001
15	8.238	0.000	0.068	0.068
16	8.238	0.000	0.156	0.157
17	8.238	0.000	0.245	0.245
18	8.238	0.000	0.334	0.334
19	8.238	0.000	0.403	0.403
20	8.238	0.000	0.469	0.470
21	8.238	0.000	0.558	0.558
22	8.238	0.000	0.647	0.647
23	8.238	0.000	0.735	0.735

## Summary

X Distance to Center of Rigidity	181.667 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear		
Y Distance to Center of Rigidity	24.963 ft	Xcm + .05*Max-X - X-cr =	18.499 ft	Torsion = 0.00 k-ft
		Xcm - .05*Max-X - X-cr =	-17.834 ft	Torsion = 0.00 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear		
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr =	8.238 ft	Torsion = 14,726.17 k-ft
		Ycm - .05*Max-Y - Y-cr =	2.155 ft	Torsion = 3,852.81 k-ft



## WALL PORTION: PIER (17-29)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	10.00	125.67	0.080	102100	0	102100	NA
SOLID STRIP	FIXED	8.00	4.50	125.67	0.036	227299	0	227299	NA
PIER 17	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.077
PIER 18	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.077
PIER 19	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.077
PIER 20	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.077
PIER 21	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.077
PIER 22	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.077
PIER 23	FIXED	8.00	4.50	7.83	0.575	12674	0	12674	0.139
PIER 24	FIXED	8.00	4.50	2.17	2.074	1548	0	1548	0.017
PIER 25	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.077
PIER 26	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.077
PIER 27	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.077
PIER 28	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.077
PIER 29	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.077

Lremain = 65.00 TOTAL (PIERS ONLY) = 91415 1.000  
WALL RIGIDITY = 61222 (K/IN)

## WALL PORTION: PIER (30-31)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	10.00	28.17	0.355	21951	0	21951	NA
SOLID STRIP	FIXED	8.00	4.50	28.17	0.180	50514	0	50514	NA
PIER 30	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.179
PIER 31	FIXED	8.00	4.50	18.17	0.248	32174	0	32174	0.821
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

Lremain = 23.17 TOTAL (PIERS ONLY) = 39192 1.000  
WALL RIGIDITY = 19502 (K/IN)

## WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	5.48	12.58	363.33	0.035	161028	0	161028	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

TOTAL (PIERS ONLY) = 0 0.000  
WALL RIGIDITY = 161028 (K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 11:26 AM

CONCRETE OR MASONRY (C/M) = C REINFORCING STRENGTH\*1.25,  $F_y$  50000 PSI  
MATERIAL STRENGTH\*1.25,  $F_c$  OR  $F'_m$  = 3125 PSI SHEAR DEMAND MODIFIER,  $m = 1.5$   
FLEXURE DEMAND MODIFIER,  $m = 2$

TOTAL WALL SHEAR = 2769 KIPS

WALL PORTION:	GROUND FLOOR FRONT WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
SOLID WALL	1.00	2769.00	8.00	4353.96	5841.45	34834.0	0.96
PIER (1-2)	0.104	287.9	8.00	335.04	449.50	2878.8	1.03
PIER (3-15)	0.315	872.5	8.00	1481.04	1987.02	8724.7	0.71
PIER 16	0.151	417.0	8.00	425.04	570.25	4170.5	1.18
PIER (17-29)	0.326	903.7	8.00	1505.04	2019.22	9037.3	0.72
PIER (30-31)	0.104	287.9	8.00	335.04	449.50	2878.8	1.03
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

2769.0

WALL PORTION:	PIER (1-2)						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
PIER 1	0.821	236.3	8.00	215.04	288.51	531.75	0.30
PIER 2	0.179	51.5	8.00	57.00	76.47	115.98	0.25
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

287.9

WALL PORTION:	PIER (3-15)						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
PIER 3	0.080	70.0	8.00	57.00	76.47	157.55	0.33
PIER 4	0.080	70.0	8.00	57.00	76.47	157.55	0.33
PIER 5	0.080	70.0	8.00	57.00	76.47	157.55	0.33
PIER 6	0.080	70.0	8.00	57.00	76.47	157.55	0.33
PIER 7	0.080	70.0	8.00	57.00	76.47	157.55	0.33
PIER 8	0.018	15.5	8.00	23.04	30.91	34.78	0.18
PIER 9	0.099	86.8	8.00	66.96	89.84	195.29	0.35
PIER 10	0.080	70.0	8.00	57.00	76.47	157.55	0.33
PIER 11	0.080	70.0	8.00	57.00	76.47	157.55	0.33
PIER 12	0.080	70.0	8.00	57.00	76.47	157.55	0.33
PIER 13	0.080	70.0	8.00	57.00	76.47	157.55	0.33
PIER 14	0.080	70.0	8.00	57.00	76.47	157.55	0.33
PIER 15	0.080	70.0	8.00	57.00	76.47	157.55	0.33
	0.000	0.0		0.00	0.00	0.00	0.00

872.5

WALL PORTION: PIER (17-29)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 17	0.077	69.4	8.00	57.00	76.47	156.09	0.33
PIER 18	0.077	69.4	8.00	57.00	76.47	156.09	0.33
PIER 19	0.077	69.4	8.00	57.00	76.47	156.09	0.33
PIER 20	0.077	69.4	8.00	57.00	76.47	156.09	0.33
PIER 21	0.077	69.4	8.00	57.00	76.47	156.09	0.33
PIER 22	0.077	69.4	8.00	57.00	76.47	156.09	0.33
PIER 23	0.139	125.3	8.00	90.96	122.04	281.90	0.37
PIER 24	0.017	15.3	8.00	23.04	30.91	34.44	0.18
PIER 25	0.077	69.4	8.00	57.00	76.47	156.09	0.33
PIER 26	0.077	69.4	8.00	57.00	76.47	156.09	0.33
PIER 27	0.077	69.4	8.00	57.00	76.47	156.09	0.33
PIER 28	0.077	69.4	8.00	57.00	76.47	156.09	0.33
PIER 29	0.077	69.4	8.00	57.00	76.47	156.09	0.33
	1.000	903.7					

WALL PORTION: PIER (30-31)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 30	0.179	51.5	8.00	57.00	76.47	115.98	0.25
PIER 31	0.821	236.3	8.00	215.04	288.51	531.75	0.30
	0.000	0.0		0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	1.000	287.9					

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 11:27 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 2850 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 2500 PSI SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: 2ND FLOOR FRONT WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	12.58	363.33	0.035	235078	0	235078	NA
SOLID STRIP	FIXED	8.00	10.00	363.33	0.028	295774	0	295774	NA
PIER (1-2)	FIXED				0.000	0	17975	17975	0.120
PIER (3-15)	FIXED				0.000	0	41601	41601	0.278
PIER 16	FIXED	8.00	10.00	35.67	0.280	28253	0	28253	0.189
PIER (17-29)					0.000	0	43746	43746	0.293
PIER (30-31)	FIXED				0.000	0	17975	17975	0.120
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

L<sub>remain</sub> = 210.01 TOTAL (PIERS ONLY) = 149550 1.000  
THK<sub>red</sub> = 6.26 WALL RIGIDITY = 132280 (K/IN)

WALL PORTION: PIER (1-2)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	10.00	28.17	0.355	21951	0	21951	NA
SOLID STRIP	FIXED	8.00	6.50	28.17	0.231	34631	0	34631	NA
PIER 1	FIXED	8.00	6.50	18.17	0.358	21768	0	21768	0.848
PIER 2	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.152
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

L<sub>remain</sub> = 23.17 TOTAL (PIERS ONLY) = 25674 1.000  
WALL RIGIDITY = 17975 (K/IN)

WALL PORTION: PIER (3-15)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	10.00	123.67	0.081	100468	0	100468	NA
SOLID STRIP	FIXED	8.00	6.50	123.67	0.053	154775	0	154775	NA
PIER 3	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.080
PIER 4	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.080
PIER 5	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.080
PIER 6	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.080
PIER 7	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.080
PIER 8	FIXED	8.00	6.50	2.17	2.995	647	0	647	0.013
PIER 9	FIXED	8.00	6.50	5.83	1.115	5058	0	5058	0.104
PIER 10	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.080
PIER 11	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.080
PIER 12	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.080
PIER 13	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.080
PIER 14	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.080
PIER 15	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.080
					0.000	0	0	0	0.000

L<sub>remain</sub> = 63.00 TOTAL (PIERS ONLY) = 48672 1.000  
WALL RIGIDITY = 41601 (K/IN)

## WALL PORTION: PIER (17-29)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	10.00	125.67	0.080	102100	0	102100	NA
SOLID STRIP	FIXED	8.00	6.50	125.67	0.052	157282	0	157282	NA
PIER 17	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.076
PIER 18	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.076
PIER 19	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.076
PIER 20	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.076
PIER 21	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.076
PIER 22	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.076
PIER 23	FIXED	8.00	6.50	7.83	0.830	7872	0	7872	0.153
PIER 24	FIXED	8.00	6.50	2.17	2.995	647	0	647	0.013
PIER 25	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.076
PIER 26	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.076
PIER 27	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.076
PIER 28	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.076
PIER 29	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.076

Lremain = 65.00 TOTAL (PIERS ONLY) = 51485 1.000  
WALL RIGIDITY = 43746 (K/IN)

## WALL PORTION: PIER (30-31)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	10.00	28.17	0.355	21951	0	21951	NA
SOLID STRIP	FIXED	8.00	6.50	28.17	0.231	34631	0	34631	NA
PIER 30	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.152
PIER 31	FIXED	8.00	6.50	18.17	0.358	21768	0	21768	0.848
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

Lremain = 23.17 TOTAL (PIERS ONLY) = 25674 1.000  
WALL RIGIDITY = 17975 (K/IN)

## WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	4.50	12.58	363.33	0.035	132231	0	132231	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

TOTAL (PIERS ONLY) = 0 0.000  
WALL RIGIDITY = 132231 (K/IN)



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 11:27 AM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3125 PSI  
REINFORCING STRENGTH\*1.25, Fy 50000 PSI  
SHEAR DEMAND MODIFIER, m = 1.5  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2149 KIPS

WALL PORTION: 2ND FLOOR FRONT WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	2149.00	8.00	4353.96	5841.45	27034.4	0.75
PIER (1-2)	0.120	258.3	8.00	335.04	449.50	2583.0	0.93
PIER (3-15)	0.278	597.8	8.00	1481.04	1987.02	5977.9	0.48
PIER 16	0.189	406.0	8.00	425.04	570.25	4059.8	1.15
PIER (17-29)	0.293	628.6	8.00	1505.04	2019.22	6286.2	0.50
PIER (30-31)	0.120	258.3	8.00	335.04	449.50	2583.0	0.93
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

2149.0

WALL PORTION: PIER (1-2)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 1	0.848	219.0	8.00	215.04	288.51	711.76	0.32
PIER 2	0.152	39.3	8.00	57.00	76.47	127.72	0.22
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

258.3

WALL PORTION: PIER (3-15)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 3	0.080	48.0	8.00	57.00	76.47	155.92	0.26
PIER 4	0.080	48.0	8.00	57.00	76.47	155.92	0.26
PIER 5	0.080	48.0	8.00	57.00	76.47	155.92	0.26
PIER 6	0.080	48.0	8.00	57.00	76.47	155.92	0.26
PIER 7	0.080	48.0	8.00	57.00	76.47	155.92	0.26
PIER 8	0.013	7.9	8.00	23.04	30.91	25.81	0.11
PIER 9	0.104	62.1	8.00	66.96	89.84	201.90	0.29
PIER 10	0.080	48.0	8.00	57.00	76.47	155.92	0.26
PIER 11	0.080	48.0	8.00	57.00	76.47	155.92	0.26
PIER 12	0.080	48.0	8.00	57.00	76.47	155.92	0.26
PIER 13	0.080	48.0	8.00	57.00	76.47	155.92	0.26
PIER 14	0.080	48.0	8.00	57.00	76.47	155.92	0.26
PIER 15	0.080	48.0	8.00	57.00	76.47	155.92	0.26
	0.000	0.0		0.00	0.00	0.00	0.00

597.8

## WALL PORTION: PIER (17-29)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 17	0.076	47.7	8.00	57.00	76.47	155.00	0.26
PIER 18	0.076	47.7	8.00	57.00	76.47	155.00	0.26
PIER 19	0.076	47.7	8.00	57.00	76.47	155.00	0.26
PIER 20	0.076	47.7	8.00	57.00	76.47	155.00	0.26
PIER 21	0.076	47.7	8.00	57.00	76.47	155.00	0.26
PIER 22	0.076	47.7	8.00	57.00	76.47	155.00	0.26
PIER 23	0.153	96.1	8.00	90.96	122.04	312.36	0.33
PIER 24	0.013	7.9	8.00	23.04	30.91	25.66	0.11
PIER 25	0.076	47.7	8.00	57.00	76.47	155.00	0.26
PIER 26	0.076	47.7	8.00	57.00	76.47	155.00	0.26
PIER 27	0.076	47.7	8.00	57.00	76.47	155.00	0.26
PIER 28	0.076	47.7	8.00	57.00	76.47	155.00	0.26
PIER 29	0.076	47.7	8.00	57.00	76.47	155.00	0.26
	1.000	628.6					

## WALL PORTION: PIER (30-31)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 30	0.152	39.3	8.00	57.00	76.47	127.72	0.22
PIER 31	0.848	219.0	8.00	215.04	288.51	711.76	0.32
	0.000	0.0		0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	1.000	258.3					

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 11:28 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 2850 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 2500 PSI SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: 3RD FLOOR FRONT WALL

[illegible]

WALL PORTION: PIER (1-2)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	6.00	10.00	28.17	0.355	16463	0	16463	NA
SOLID STRIP	FIXED	6.00	6.50	28.17	0.231	25974	0	25974	NA
PIER 1	FIXED	6.00	6.50	18.17	0.358	16326	0	16326	0.848
PIER 2	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.152
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
Lremain =				23.17	TOTAL (PIERS ONLY) =			19255	1.000
					WALL RIGIDITY =			13481	(K/IN)

WALL PORTION: PIER (3-15)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	6.00	10.00	123.87	0.081	75351	0	75351	NA
SOLID STRIP	FIXED	6.00	6.50	123.87	0.053	116081	0	116081	NA
PIER 3	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.080
PIER 4	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.080
PIER 5	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.080
PIER 6	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.080
PIER 7	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.080
PIER 8	FIXED	6.00	6.50	2.17	2.985	485	0	485	0.013
PIER 9	FIXED	6.00	6.50	5.83	1.115	3794	0	3794	0.104
PIER 10	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.080
PIER 11	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.080
PIER 12	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.080
PIER 13	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.080
PIER 14	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.080
PIER 15	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.080
					0.000	0	0	0	0.000
Lremain =				63.00	TOTAL (PIERS ONLY) =			36504	1.000
					WALL RIGIDITY =			31200	(K/IN)

## WALL PORTION: PIER (17-29)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	6.00	10.00	125.67	0.080	76575	0	76575	NA
SOLID STRIP	FIXED	6.00	6.50	125.67	0.052	117962	0	117962	NA
PIER 17	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.076
PIER 18	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.076
PIER 19	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.076
PIER 20	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.076
PIER 21	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.076
PIER 22	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.076
PIER 23	FIXED	6.00	6.50	7.83	0.830	5904	0	5904	0.153
PIER 24	FIXED	6.00	6.50	2.17	2.995	485	0	485	0.013
PIER 25	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.076
PIER 26	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.076
PIER 27	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.076
PIER 28	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.076
PIER 29	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.076

Lremain = 65.00 TOTAL (PIERS ONLY) = 38814 1.000  
WALL RIGIDITY = 32809 (K/IN)

## WALL PORTION: PIER (30-31)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	6.00	10.00	28.17	0.355	16463	0	16463	NA
SOLID STRIP	FIXED	6.00	6.50	28.17	0.231	25974	0	25974	NA
PIER 30	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.152
PIER 31	FIXED	6.00	6.50	18.17	0.358	16326	0	16326	0.848
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

Lremain = 23.17 TOTAL (PIERS ONLY) = 19255 1.000  
WALL RIGIDITY = 13481 (K/IN)

## WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	3.38	12.58	363.33	0.035	99193	0	99193	NA
SOLID STRIP	CANT	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

TOTAL (PIERS ONLY) = 0 0.000  
WALL RIGIDITY = 99193 (K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 11:28 AM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3125 PSI  
REINFORCING STRENGTH\*1.25, Fy 50000 PSI  
SHEAR DEMAND MODIFIER, m = 1.5  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 913.9 KIPS

WALL PORTION: 3RD FLOOR FRONT WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	913.90	6.00	4353.96	4381.09	11496.9	0.32
PIER (1-2)	0.120	109.8	6.00	335.04	337.13	1098.5	0.39
PIER (3-15)	0.278	254.2	6.00	1481.04	1490.27	2542.2	0.21
PIER 16	0.189	172.7	6.00	425.04	427.69	1726.5	0.49
PIER (17-29)	0.293	267.3	6.00	1505.04	1514.42	2673.3	0.21
PIER (30-31)	0.120	109.8	6.00	335.04	337.13	1098.5	0.39
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

913.9

WALL PORTION: PIER (1-2)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 1	0.048	93.1	6.00	215.04	216.38	302.69	0.14
PIER 2	0.152	16.7	6.00	57.00	57.36	54.32	0.09
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

109.8

WALL PORTION: PIER (3-15)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 3	0.080	20.4	6.00	57.00	57.36	66.31	0.11
PIER 4	0.080	20.4	6.00	57.00	57.36	66.31	0.11
PIER 5	0.080	20.4	6.00	57.00	57.36	66.31	0.11
PIER 6	0.080	20.4	6.00	57.00	57.36	66.31	0.11
PIER 7	0.080	20.4	6.00	57.00	57.36	66.31	0.11
PIER 8	0.013	3.4	6.00	23.04	23.18	10.98	0.05
PIER 9	0.104	26.4	6.00	66.96	67.38	85.86	0.12
PIER 10	0.080	20.4	6.00	57.00	57.36	66.31	0.11
PIER 11	0.080	20.4	6.00	57.00	57.36	66.31	0.11
PIER 12	0.080	20.4	6.00	57.00	57.36	66.31	0.11
PIER 13	0.080	20.4	6.00	57.00	57.36	66.31	0.11
PIER 14	0.080	20.4	6.00	57.00	57.36	66.31	0.11
PIER 15	0.080	20.4	6.00	57.00	57.36	66.31	0.11
	0.000	0.0		0.00	0.00	0.00	0.00

254.2

## WALL PORTION: PIER (17-29)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 17	0.076	20.3	6.00	57.00	57.36	65.92	0.11
PIER 18	0.076	20.3	6.00	57.00	57.36	65.92	0.11
PIER 19	0.076	20.3	6.00	57.00	57.36	65.92	0.11
PIER 20	0.076	20.3	6.00	57.00	57.36	65.92	0.11
PIER 21	0.076	20.3	6.00	57.00	57.36	65.92	0.11
PIER 22	0.076	20.3	6.00	57.00	57.36	65.92	0.11
PIER 23	0.153	40.9	6.00	90.96	91.53	132.84	0.14
PIER 24	0.013	3.4	6.00	23.04	23.18	10.91	0.05
PIER 25	0.076	20.3	6.00	57.00	57.36	65.92	0.11
PIER 26	0.076	20.3	6.00	57.00	57.36	65.92	0.11
PIER 27	0.076	20.3	6.00	57.00	57.36	65.92	0.11
PIER 28	0.076	20.3	6.00	57.00	57.36	65.92	0.11
PIER 29	0.076	20.3	6.00	57.00	57.36	65.92	0.11
	1.000	267.3					

## WALL PORTION: PIER (30-31)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 30	0.152	16.7	6.00	57.00	57.36	54.32	0.09
PIER 31	0.848	93.1	6.00	215.04	216.38	302.69	0.14
	0.000	0.0		0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	1.000	109.8					

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 11:13 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 2850 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 2500 PSI SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	12.58	363.33	0.035	235078	0	235078	NA
SOLID STRIP	FIXED	8.00	4.50	363.33	0.012	657418	0	657418	NA
PIER 1	FIXED	8.00	4.50	6.42	0.701	9883	0	9883	0.032
PIER 2	FIXED	8.00	4.50	6.42	0.701	9883	0	9883	0.032
PIER 3	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 4	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 5	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 6	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 7	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 8	FIXED	8.00	4.50	7.67	0.587	12360	0	12360	0.040
PIER 9	FIXED	8.00	4.50	11.00	0.409	18782	0	18782	0.061
PIER 10	FIXED	8.00	4.50	7.67	0.587	12360	0	12360	0.040
PIER 11	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 12	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 13	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 14	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 15	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 16	FIXED	8.00	4.50	6.42	0.701	9883	0	9883	0.032
PIER 17	FIXED	8.00	4.50	12.17	0.370	20997	0	20997	0.068
PIER 18	FIXED	8.00	4.50	6.42	0.701	9883	0	9883	0.032
PIER 19	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 20	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 21	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 22	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 23	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 24	FIXED	8.00	4.50	7.67	0.587	12360	0	12360	0.040
PIER 25	FIXED	8.00	4.50	11.00	0.409	18782	0	18782	0.061
PIER 26	FIXED	8.00	4.50	7.67	0.587	12360	0	12360	0.040
PIER 27	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 28	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 29	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 30	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 31	FIXED	8.00	4.50	5.00	0.900	7018	0	7018	0.023
PIER 32	FIXED	8.00	4.50	6.42	0.701	9883	0	9883	0.032
PIER 33	FIXED	8.00	4.50	6.42	0.701	9883	0	9883	0.032
					0.000	0			0.000
					0.000	0			0.000

L<sub>remain</sub> = 203.37 TOTAL (PIERS ONLY) = 307648 1.000  
THK<sub>red</sub> = 6.74 WALL RIGIDITY = 167133 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

4050

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	5.69	12.58	363.33	0.035	167199	0	167199	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =		0	0.000	
					WALL RIGIDITY =		167199	(K/IN)	



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 11:13 AM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH\*1.25, F<sub>c</sub> OR F<sub>m</sub> = 3125 PSI  
REINFORCING STRENGTH\*1.25, F<sub>y</sub> 50000 PSI  
SHEAR DEMAND MODIFIER, m = 1.5  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2795 KIPS

WALL PORTION: GROUND FLOOR BACK WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	2795.00	8.00	4353.96	5841.45	35161.1	0.97
PIER 1	0.032	89.8	8.00	74.04	99.34	202.0	0.33
PIER 2	0.032	89.8	8.00	74.04	99.34	202.0	0.33
PIER 3	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 4	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 5	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 6	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 7	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 8	0.040	112.3	8.00	89.04	119.46	252.6	0.34
PIER 9	0.061	170.6	8.00	129.00	173.07	383.9	0.36
PIER 10	0.040	112.3	8.00	89.04	119.46	252.6	0.34
PIER 11	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 12	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 13	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 14	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 15	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 16	0.032	89.8	8.00	74.04	99.34	202.0	0.33
PIER 17	0.068	190.8	8.00	143.04	191.91	429.2	0.36
PIER 18	0.032	89.8	8.00	74.04	99.34	202.0	0.33
PIER 19	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 20	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 21	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 22	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 23	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 24	0.040	112.3	8.00	89.04	119.46	252.6	0.34
PIER 25	0.061	170.6	8.00	129.00	173.07	383.9	0.36
PIER 26	0.040	112.3	8.00	89.04	119.46	252.6	0.34
PIER 27	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 28	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 29	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 30	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 31	0.023	63.8	8.00	57.00	76.47	143.4	0.30
PIER 32	0.032	89.8	8.00	74.04	99.34	202.0	0.33
PIER 33	0.032	89.8	8.00	74.04	99.34	202.0	0.33
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

2795.0

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 11:11 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 2850 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 2500 PSI SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	12.58	363.33	0.035	235078	0	235078	NA
SOLID STRIP	FIXED	8.00	6.50	363.33	0.018	455109	0	455109	NA
PIER 1	FIXED	8.00	6.50	6.42	1.012	5887	0	5887	0.032
PIER 2	FIXED	8.00	6.50	6.42	1.012	5887	0	5887	0.032
PIER 3	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 4	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 5	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 6	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 7	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 8	FIXED	8.00	6.50	7.67	0.847	7647	0	7647	0.042
PIER 9	FIXED	8.00	6.50	11.00	0.591	12252	0	12252	0.067
PIER 10	FIXED	8.00	6.50	7.67	0.847	7647	0	7647	0.042
PIER 11	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 12	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 13	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 14	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 15	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 16	FIXED	8.00	6.50	6.42	1.012	5887	0	5887	0.032
PIER 17	FIXED	8.00	6.50	12.17	0.534	13836	0	13836	0.076
PIER 18	FIXED	8.00	6.50	6.42	1.012	5887	0	5887	0.032
PIER 19	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 20	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 21	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 22	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 23	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 24	FIXED	8.00	6.50	7.67	0.847	7647	0	7647	0.042
PIER 25	FIXED	8.00	6.50	11.00	0.591	12252	0	12252	0.067
PIER 26	FIXED	8.00	6.50	7.67	0.847	7647	0	7647	0.042
PIER 27	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 28	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 29	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 30	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 31	FIXED	8.00	6.50	5.00	1.300	3906	0	3906	0.021
PIER 32	FIXED	8.00	6.50	6.42	1.012	5887	0	5887	0.032
PIER 33	FIXED	8.00	6.50	6.42	1.012	5887	0	5887	0.032
					0.000	0			0.000
					0.000	0			0.000

L<sub>remain</sub> = 203.37 TOTAL (PIERS ONLY) = 182376 1.000  
THK<sub>red</sub> = 6.18 WALL RIGIDITY = 132629 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	4.51	12.58	363.33	0.035	132525	0	132525	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			132525	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 11:11 AM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3125 PSI  
REINFORCING STRENGTH\*1.25, Fy 50000 PSI  
SHEAR DEMAND MODIFIER, m = 1.5  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2106 KIPS

WALL PORTION:	2ND FLOOR BACK WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	2106.00	8.00	4353.96	5841.45	26493.5	0.73
PIER 1	0.032	68.0	8.00	74.04	99.34	220.9	0.36
PIER 2	0.032	68.0	8.00	74.04	99.34	220.9	0.36
PIER 3	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 4	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 5	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 6	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 7	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 8	0.042	88.3	8.00	89.04	119.46	287.0	0.39
PIER 9	0.067	141.5	8.00	129.00	173.07	459.8	0.43
PIER 10	0.042	88.3	8.00	89.04	119.46	287.0	0.39
PIER 11	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 12	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 13	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 14	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 15	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 16	0.032	68.0	8.00	74.04	99.34	220.9	0.36
PIER 17	0.076	159.8	8.00	143.04	191.91	519.3	0.44
PIER 18	0.032	68.0	8.00	74.04	99.34	220.9	0.36
PIER 19	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 20	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 21	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 22	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 23	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 24	0.042	88.3	8.00	89.04	119.46	287.0	0.39
PIER 25	0.067	141.5	8.00	129.00	173.07	459.8	0.43
PIER 26	0.042	88.3	8.00	89.04	119.46	287.0	0.39
PIER 27	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 28	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 29	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 30	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 31	0.021	45.1	8.00	57.00	76.47	146.6	0.31
PIER 32	0.032	68.0	8.00	74.04	99.34	220.9	0.36
PIER 33	0.032	68.0	8.00	74.04	99.34	220.9	0.36
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

1.000 2106.0

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 11:13 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 2850 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 2500 PSI SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	6.00	12.58	363.33	0.035	176082	0	176082	NA
SOLID STRIP	CANT	6.00	6.50	363.33	0.018	341214	0	341214	NA
PIER 1	FIXED	6.00	6.50	6.42	1.012	4415	0	4415	0.032
PIER 2	FIXED	6.00	6.50	6.42	1.012	4415	0	4415	0.032
PIER 3	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 4	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 5	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 6	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 7	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 8	FIXED	6.00	6.50	7.67	0.847	5735	0	5735	0.042
PIER 9	FIXED	6.00	6.50	11.00	0.591	9189	0	9189	0.067
PIER 10	FIXED	6.00	6.50	7.67	0.847	5735	0	5735	0.042
PIER 11	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 12	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 13	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 14	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 15	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 16	FIXED	6.00	6.50	6.42	1.012	4415	0	4415	0.032
PIER 17	FIXED	6.00	6.50	12.17	0.534	10377	0	10377	0.076
PIER 18	FIXED	6.00	6.50	6.42	1.012	4415	0	4415	0.032
PIER 19	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 20	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 21	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 22	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 23	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 24	FIXED	6.00	6.50	7.67	0.847	5735	0	5735	0.042
PIER 25	FIXED	6.00	6.50	11.00	0.591	9189	0	9189	0.067
PIER 26	FIXED	6.00	6.50	7.67	0.847	5735	0	5735	0.042
PIER 27	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 28	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 29	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 30	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 31	FIXED	6.00	6.50	5.00	1.300	2930	0	2930	0.021
PIER 32	FIXED	6.00	6.50	6.42	1.012	4415	0	4415	0.032
PIER 33	FIXED	6.00	6.50	6.42	1.012	4415	0	4415	0.032
					0.000	0			0.000
					0.000	0			0.000
L <sub>remain</sub> =			203.37	TOTAL (PIERS ONLY) =			136782	1.000	
THK <sub>red</sub> =			4.64	WALL RIGIDITY =			99410	(K/IN)	

## WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	3.39	12.58	363.33	0.035	99486	0	99486	NA
SOLID STRIP	CANT	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			99486	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 11:13 AM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3125 PSI  
REINFORCING STRENGTH\*1.25, Fy 50000 PSI  
SHEAR DEMAND MODIFIER, m = 1.5  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 894.8 KIPS

WALL PORTION: 3RD FLOOR BACK WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	894.80	6.00	4353.96	4381.09	11256.6	0.31
PIER 1	0.032	28.9	6.00	74.04	74.50	93.9	0.15
PIER 2	0.032	28.9	6.00	74.04	74.50	93.9	0.15
PIER 3	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 4	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 5	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 6	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 7	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 8	0.042	37.5	6.00	89.04	89.59	121.9	0.16
PIER 9	0.067	60.1	6.00	129.00	129.80	195.4	0.18
PIER 10	0.042	37.5	6.00	89.04	89.59	121.9	0.16
PIER 11	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 12	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 13	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 14	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 15	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 16	0.032	28.9	6.00	74.04	74.50	93.9	0.15
PIER 17	0.076	67.9	6.00	143.04	143.93	220.6	0.19
PIER 18	0.032	28.9	6.00	74.04	74.50	93.9	0.15
PIER 19	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 20	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 21	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 22	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 23	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 24	0.042	37.5	6.00	89.04	89.59	121.9	0.16
PIER 25	0.067	60.1	6.00	129.00	129.80	195.4	0.18
PIER 26	0.042	37.5	6.00	89.04	89.59	121.9	0.16
PIER 27	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 28	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 29	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 30	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 31	0.021	19.2	6.00	57.00	57.36	62.3	0.13
PIER 32	0.032	28.9	6.00	74.04	74.50	93.9	0.15
PIER 33	0.032	28.9	6.00	74.04	74.50	93.9	0.15
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

1.000 894.8





RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 01:04 PM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH\*1.25, F<sub>c</sub> OR F<sub>m</sub> = 3125 PSI  
REINFORCING STRENGTH\*1.25, F<sub>y</sub> 50000 PSI  
SHEAR DEMAND MODIFIER, m = 1.5  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2209 KIPS

WALL PORTION:	GROUND FLOOR SIDE WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	2209.00	8.00	594.00	796.93	27789.2	5.68
PIER 1	0.142	313.4	8.00	72.96	97.89	705.2	1.18
PIER 2	0.716	1582.2	8.00	324.96	435.98	3559.8	1.32
PIER 3	0.142	313.4	8.00	72.96	97.89	705.2	1.18
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

2209.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 01:05 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	2850 KSI
MATERIAL STRENGTH, F'c OR F'm =	2500 PSI	SHEAR MODULUS =	1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR SIDE WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	16.00	12.58	50.00	0.252	63298	0	63298	NA
SOLID STRIP	FIXED	16.00	6.50	50.00	0.130	124523	0	124523	NA
PIER 1	FIXED	16.00	6.50	6.33	1.027	11521	0	11521	0.128
PIER 2	FIXED	16.00	6.50	27.33	0.238	67119	0	67119	0.744
PIER 3	FIXED	16.00	6.50	6.33	1.027	11521	0	11521	0.128
					0.000	0			0.000
					0.000	0			0.000
					TOTAL (PIERS ONLY) =			90161	1,000
					WALL RIGIDITY =			53025	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
 TIME: 01:05 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25,  $F_y$  50000 PSI  
 MATERIAL STRENGTH\*1.25,  $F'_c$  OR  $F'_m$  = 3125 PSI SHEAR DEMAND MODIFIER,  $m$  = 1.5  
 FLEXURE DEMAND MODIFIER,  $m$  = 2

TOTAL WALL SHEAR = 1708 KIPS

WALL PORTION: 2ND FLOOR SIDE WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
SOLID WALL	1.00	1708.00	16.00	594.00	1593.87	21486.6	4.36
PIER 1	0.128	218.3	16.00	72.96	195.77	709.3	1.18
PIER 2	0.744	1271.5	16.00	324.96	871.96	4132.4	1.53
PIER 3	0.128	218.3	16.00	72.96	195.77	709.3	1.18
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00
	1.000	1708.0					



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
 TIME: 01:05 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 50000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3125 PSI SHEAR DEMAND MODIFIER, m = 1.5  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 35.2 KIPS

WALL PORTION:	3RD FLOOR SIDE WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	35.20	12.00	594.00	1195.40	442.8	0.09
PIER 1	0.128	4.5	12.00	72.96	146.83	14.6	0.02
PIER 2	0.744	26.2	12.00	324.96	653.97	85.2	0.03
PIER 3	0.128	4.5	12.00	72.96	146.83	14.6	0.02
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00
	1.000	35.2					

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
 TIME: 11:22 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 2850 KSI  
 MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 2500 PSI SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR CROSS WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	2.00	12.58	50.00	0.252	7912	0	7912	NA
SOLID STRIP	FIXED	2.00	4.50	50.00	0.090	22554	0	22554	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0			0.000
					0.000	0			0.000
					TOTAL (PIERS ONLY) =		0	0.000	
					WALL RIGIDITY =		ERROR!	(K/IN)	

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
TIME: 11:22 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 50000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3125 PSI SHEAR DEMAND MODIFIER, m = 1.5  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 522.5 KIPS

WALL PORTION:	GROUND FLOOR CROSS WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	522.50	2.00	594.00	199.23	6573.1	1.34
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

0.0

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
 TIME: 11:14 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 2850 KSI  
 MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 2500 PSI SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR CROSS WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	2.00	12.58	50.00	0.252	7912	0	7912	NA
SOLID STRIP	FIXED	2.00	6.50	50.00	0.130	15565	0	15565	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0			0.000
					0.000	0			0.000
TOTAL (PIERS ONLY) =							0	0.000	
WALL RIGIDITY =							ERROR!	(K/IN)	



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03  
 TIME: 11:14 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 50000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3125 PSI  
 SHEAR DEMAND MODIFIER, m = 1.5  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 403.8 KIPS

WALL PORTION:	2ND FLOOR CROSS WALL		b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
	%R	V, k					
SOLID WALL	1.00	403.80	2.00	594.00	199.23	5079.8	1.03
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0					

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 02/07/03  
TIME: 11:15 AM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	2850 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	2500 PSI	SHEAR MODULUS =	1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR CROSS WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	2.00	12.58	50.00	0.252	7420	0	7420	NA
SOLID STRIP	CANT	2.00	6.50	50.00	0.130	15290	0	15290	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0			0.000
					0.000	0			0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			ERROR!	(K/IN)

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

DATE: 02/07/03  
TIME: 11:15 AM

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

CONCRETE OR MASONRY [C/M] =  
MATERIAL STRENGTH\*1.25, F'c OR F'm =

C  
3125 PSI

REINFORCING STRENGTH\*1.25, Fy  
SHEAR DEMAND MODIFIER, m =  
FLEXURE DEMAND MODIFIER, m =

50000 PSI  
1.5  
2

TOTAL WALL SHEAR = 0 KIPS

WALL PORTION:	3RD FLOOR CROSS WALL %R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	0.00	2.00	594.00	199.23	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					

# ***SEISMIC EVALUATION and REHABILITATION REPORT***

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## ***APPENDIX B: SEISMIC RETROFIT CALCULATIONS***

WHOLE BARRACKS RENEWAL  
BRIGADE COMPLEX, PHASE 3A, QUAD C  
FY03 MCA PN52068 & BUP 52069  
SCHOFIELD BARRACKS, OAHU, HAWAII

May 2003

### **PREPARED FOR:**

DEPARTMENT OF THE ARMY  
U.S. Army Engineer District, Honolulu  
Engineering Services Branch  
Engineering and Construction Division  
Fort Shafter, Hawaii 96858-5440

### **PREPARED BY:**



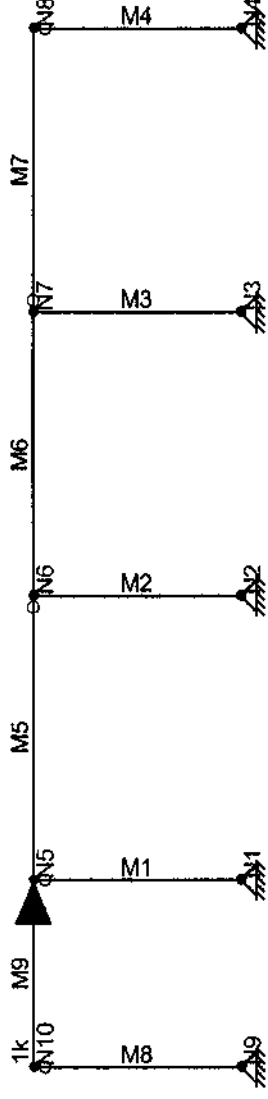
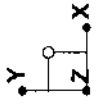
Mitsunaga and Associates, Inc.  
747 Amana Street Suite 216  
Honolulu, Hawaii 96814  
Phone: (808) 945-7882 Fax: (808) 946-2563  
Email: Mitsunaga003@hawaii.rr.com

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FOR OFFICIAL USE ONLY

Documentation for the proposed seismic retrofit includes the following:

- Dead and live load determination;
- Total building dead load and center of mass determination at each floor level;
- Seismic base shear and force distribution at each floor level;
- Roof diaphragm shear capacity check;
- Estimation of concrete frame rigidities and equivalent solid wall thicknesses;
- Rigidity calculations for shear walls with openings and equivalent solid wall thicknesses;
- Seismic shear distribution to walls based on rigid diaphragm analysis at each floor level and for the roof diaphragm in the longitudinal direction;
- Seismic shear distribution to walls and frames based on flexible diaphragm analysis for the roof diaphragm in the transverse direction; and
- Determination of shear and flexural capacities for walls and frames and comparison with the distributed seismic forces.



Loads: BLC 1, LATERAL  
Results for LC 1, LATERAL

Mitsunaga & Associates, Inc.

Keith Kalani

QUAD C Existing Concrete Frame at 3rd Floor

Retrofit frame in middle bay (second from right)

February 1, 2003

3:49 PM

QUADC-NEW.r2d

Company : Mitsunaga & Associates, Inc.  
 Designer : Keith Kalani  
 Job Number :

# QUAD C Existing Concrete Frame at 3rd Floor

February 2, 2003  
 7:56 AM  
 Checked By: \_\_\_\_\_

## Global

Steel Code	None
Allowable Stress Increase Factor (ASIF)	1.333
Include Shear Deformation	Yes
No. of Sections for Member Calc.	5
Redesign Sections	Yes
R-Delta Analysis Tolerance	0.50%

## Materials (General)

Material Label	Young's Modulus (ksi)	Shear Modulus (ksi)	Poisson's Ratio	Thermal Coef. (per 10 <sup>5</sup> F)	Weight Density (k/ft <sup>3</sup> )	Yield Stress (ksi)
CONC	2015	907	.11	.65	.15	2.55

## Sections

Section Label	Database Shape	Material Label	Area (in) <sup>2</sup>	SA (0,180)	SA (90,270)	I (90,270) (in <sup>4</sup> )	I (0,180) (in <sup>4</sup> )	T/C Only
COL		CONC	100	1.2	1.2	833	833	
BEAM1		CONC	100	1.2	1.2	833	833	
COL2		CONC	384	1.2	1.2	8192	18432	
BEAM2		CONC	384	1.2	1.2	8192	18432	

## Joint Coordinates

Joint Label	X Coordinate (ft)	Y Coordinate (ft)	Joint Temperature (F)
N1	0	0	0
N2	16.42	0	0
N3	32.75	0	0
N4	49.17	0	0
N5	0	12	0
N6	16.42	12	0
N7	32.75	12	0
N8	49.17	12	0
N9	-10.83	0	0
N10	-10.83	12	0

## Boundary Conditions

Joint Label	X Translation (k/in)	Y Translation (k/in)	Rotation (k-ft/rad)
N1	Reaction	Reaction	
N2	Reaction	Reaction	
N3	Reaction	Reaction	
N4	Reaction	Reaction	
N9	Reaction	Reaction	

## Member Data

Member Label	I Joint	J Joint	Rotate (degrees)	Shape / Section Set	Material Set	Phys Memb TOM	End Releases I-End AVM	J-End AVM	End Offsets I-End (in)	J-End (in)	Inactive Code	Length (ft)
M1	N1	N5		COL	CONC	Y		PIN				12
M2	N2	N6		COL2	CONC	Y						12
M3	N3	N7		COL2	CONC	Y						12
M4	N4	N8		COL	CONC	Y		PIN				12
M5	N5	N6		BEAM	CONC	Y		PIN				16.42
M6	N6	N7		BEAM2	CONC	Y						16.33
M7	N7	N8		BEAM	CONC	Y	PIN					16.42
M8	N9	N10		BEAM	CONC	Y		PIN				12
M9	N10	N5		BEAM	CONC	Y						10.83

Company : Mitsunaga & Associates, Inc.  
 Designer : Keith Kalani  
 Job Number :

QUAD C Existing Concrete Frame at 3rd Floor

February 2, 2003  
 7:56 AM  
 Checked By: \_\_\_\_\_

### Basic Load Case Data

BLC No.	Basic Load Case Description	Category Code	Category Description	Gravity X	Gravity Y	Load Type Totals Joint	Point	Direct Dist.
1	1 KIP LOAD	None				1		
2	GRAVITY	None				2		
3	356 LATERAL	None				1		

### Joint Loads/Enforced Displacements, Category : None, BLC 1 : 1 KIP LOAD

Joint Label	[L]oad, [M]ass, or, [D]isplacement	Direction	Magnitude (k, k-ft, in, rad, k*s^2/ft)
N5	L	X	1

### Joint Loads/Enforced Displacements, Category : None, BLC 2 : GRAVITY

Joint Label	[L]oad, [M]ass, or, [D]isplacement	Direction	Magnitude (k, k-ft, in, rad, k*s^2/ft)
N6	L	Y	-12
N7	L	Y	12

### Joint Loads/Enforced Displacements, Category : None, BLC 3 : 356 LATERAL

Joint Label	[L]oad, [M]ass, or, [D]isplacement	Direction	Magnitude (k, k-ft, in, rad, k*s^2/ft)
N5	L	X	69

### Load Combinations

Num	Description	Env	WS	PD	SRSS	CD	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	1 KIP	y				1	1	1						
2	DL + E	y				1	2	1	3	1				

### Reactions, By Combination

LC	Joint Label	X Force (k)	Y Force (k)	Moment (k-ft)
1	N1	0	0	0
1	N2	501	735	0
1	N3	-499	735	0
1	N4	0	0	0
1	N9	0	0	0
1	Totals:	-1	0	
1	COG (ft):	NC	NC	

### Joint Displacements, By Combination

LC	Joint Label	X Translation (in)	Y Translation (in)	Rotation (radians)
1	N1	0	0	-1.692e-4
1	N2	0	0	-2.073e-4
1	N3	0	0	-2.063e-4
1	N4	0	0	-1.616e-4
1	N5	.024	0	2.767e-7
1	N6	.023	0	-6.753e-5
1	N7	.023	0	-6.695e-5
1	N8	.023	0	6.941e-7
1	N9	0	0	-1.692e-4
1	N10	.024	0	-1.349e-7



Company : Mitsunaga & Associates, Inc.  
 Designer : Kelth Kalani  
 Job Number : QUAD C Existing Concrete Frame at 3rd Floor

February 2, 2003  
 7:56 AM  
 Checked By: \_\_\_\_\_

### Member Section Forces, By Combination

LC	Member Label	Section	Axial (k)	Shear (k)	Moment (k-ft)
1	M1	1	0	0	0
		2	0	0	0
		3	0	0	0
		4	0	0	0
		5	0	0	0
1	M2	1	.735	.501	0
		2	-.735	.501	-1.502
		3	.735	.501	3.005
		4	-.735	.501	-4.507
		5	.735	.501	6.009
1	M3	1	.735	.499	0
		2	.735	.499	-1.498
		3	.735	.499	-2.995
		4	.735	.499	-4.493
		5	.735	.499	-5.991
1	M4	1	0	0	0
		2	0	0	0
		3	0	0	0
		4	0	0	0
		5	0	0	0
1	M5	1	1	0	0
		2	1	0	0
		3	1	0	0
		4	1	0	0
		5	1	0	0
1	M6	1	.499	.735	6.009
		2	.499	-.735	-3.009
		3	.499	.735	6.009
		4	.499	-.735	-2.991
		5	.499	.735	6.991
1	M7	1	0	0	0
		2	0	0	0
		3	0	0	0
		4	0	0	0
		5	0	0	0
1	M8	1	0	0	0
		2	0	0	0
		3	0	0	0
		4	0	0	0
		5	0	0	0
1	M9	1	0	0	0
		2	0	0	0
		3	0	0	0
		4	0	0	0
		5	0	0	0

Company : Mitsunaga & Associates, Inc.  
 Designer : Keith Kalani  
 Job Number :

# QUAD C Existing Concrete Frame at 3rd Floor

February 2, 2003  
 7:57 AM  
 Checked By: \_\_\_\_\_

## Global

Steel Code	None
Allowable Stress Increase Factor (ASIF)	1.333
Include Shear Deformation	Yes
No. of Sections for Member Calc	5
Redesign Sections	Yes
Re-Data Analysis Tolerance	0.50%

## Materials (General)

Material Label	Young's Modulus (ksi)	Shear Modulus (ksi)	Poisson's Ratio	Thermal Coef. (per 10 <sup>5</sup> F)	Weight Density (k/ft <sup>3</sup> )	Yield Stress (ksi)
CONC	2015	907	.11	.65	.15	2.55

## Sections

Section Label	Database Shape	Material Label	Area (in) <sup>2</sup>	SA (0,180)	SA (90,270)	I (90,270) (in <sup>4</sup> )	I (0,180) (in <sup>4</sup> )	T/C Only
COL		CONC	100	1.2	1.2	833	833	
BEAM		CONC	100	1.2	1.2	833	833	
COL2		CONC	384	1.2	1.2	8192	18432	
BEAM2		CONC	384	1.2	1.2	8192	18432	

## Joint Coordinates

Joint Label	X Coordinate (ft)	Y Coordinate (ft)	Joint Temperature (F)
N1	0	0	0
N2	16.42	0	0
N3	32.75	0	0
N4	49.17	0	0
N5	0	12	0
N6	16.42	12	0
N7	32.75	12	0
N8	49.17	12	0
N9	-10.83	0	0
N10	-10.83	12	0

## Boundary Conditions

Joint Label	X Translation (k/in)	Y Translation (k/in)	Rotation (k-ft/rad)
N1	Reaction	Reaction	
N2	Reaction	Reaction	
N3	Reaction	Reaction	
N4	Reaction	Reaction	
N9	Reaction	Reaction	

## Member Data

Member Label	I Joint	J Joint	Rotate (degrees)	Shape / Section Set	Material Set	Phys Memb TOM	End Releases I-End AVM	J-End AVM	End Offsets I-End (in)	J-End (in)	Inactive Code	Length (ft)
M1	N1	N5		COL	CONC	Y		PIN				12
M2	N2	N6		COL2	CONC	Y						12
M3	N3	N7		COL2	CONC	Y						12
M4	N4	N8		COL	CONC	Y		PIN				12
M5	N5	N6		BEAM	CONC	Y		PIN				16.42
M6	N6	N7		BEAM2	CONC	Y						16.33
M7	N7	N8		BEAM	CONC	Y	PIN					16.42
M8	N9	N10		BEAM	CONC	Y		PIN				12
M9	N10	N5		BEAM	CONC	Y						10.83

Company : Mitsunaga & Associates, Inc.  
 Designer : Kelth Kalani  
 Job Number :

February 2, 2003  
 7:57 AM  
 Checked By: \_\_\_\_\_

**QUAD C Existing Concrete Frame at 3rd Floor**

**Basic Load Case Data**

BLC No.	Basic Load Case Description	Category Code	Category Description	Gravity X	Gravity Y	Joint	Load Type Totals Point	Direct Dist.
1	1 KIP LOAD	None					1	
2	GRAVITY	None				2		
3	356 LATERAL	None				1		

**Joint Loads/Enforced Displacements, Category : None, BLC 1 : 1 KIP LOAD**

Joint Label	[L]oad,[M]ass,or, [D]isplacement	Direction	Magnitude (k, k-ft, in, rad, k*s^2/ft)
N5	L	X	1

**Joint Loads/Enforced Displacements, Category : None, BLC 2 : GRAVITY**

Joint Label	[L]oad,[M]ass,or, [D]isplacement	Direction	Magnitude (k, k-ft, in, rad, k*s^2/ft)
N6	L	Y	-12
N7	L	Y	12

**Joint Loads/Enforced Displacements, Category : None, BLC 3 : 356 LATERAL**

Joint Label	[L]oad,[M]ass,or, [D]isplacement	Direction	Magnitude (k, k-ft, in, rad, k*s^2/ft)
N5	L	X	69

**Load Combinations**

Num	Description	Env	WS	PD	SRSS	CD	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	1 KIP	y				1	1	1						
2	D.L+L+E	y			6	1	2	1	3	1				

**Reactions, By Combination**

LC	Joint Label	X Force (k)	Y Force (k)	Moment (k-ft)
2	N1	0	-0.005	0
2	N2	34.909	39.23	0
2	N3	-34.091	63.231	0
2	N4	0	0	0
2	N9	0	0.004	0
2	Totals:	-69	24	
2	COG (ft):	X: 24.585	Y: 12	

**Joint Displacements, By Combination**

LC	Joint Label	X Translation (in)	Y Translation (in)	Rotation (radians)
2	N1	0	0	-1.179e-2
2	N2	0	0	-1.445e-2
2	N3	0	0	-1.438e-2
2	N4	0	0	-1.126e-2
2	N5	1.698	0	1.477e-5
2	N6	1.631	0.007	-4.708e-3
2	N7	1.622	-0.012	-4.668e-3
2	N8	1.622	0	5.972e-5
2	N9	0	0	-1.179e-2
2	N10	1.698	0	-7.223e-6

13008

Company : Mitsunaga & Associates, Inc.  
 Designer : Keith Kalani  
 Job Number : QUAD C Existing Concrete Frame at 3rd Floor

February 2, 2003  
 7:57 AM  
 Checked By: \_\_\_\_\_

### Member Section Forces, By Combination

LC	Member Label	Section	Axial (k)	Shear (k)	Moment (k-ft)
2	M1	1	-0.005	0	0
		2	-0.005	0	0
		3	-0.005	0	0
		4	-0.005	0	0
		5	-0.005	0	0
2	M2	1	-39.23	34.909	0
		2	-39.23	34.909	-104.726
		3	-39.23	34.909	-209.452
		4	-39.23	34.909	-314.178
		5	-39.23	34.909	-418.904
2	M3	1	63.231	34.803	0
		2	63.231	34.803	104.411
		3	63.231	34.803	-208.82
		4	63.231	34.803	-313.231
		5	63.231	34.803	-417.641
2	M4	1	0	0	0
		2	0	0	0
		3	0	0	0
		4	0	0	0
		5	0	0	0
2	M5	1	69	-0.003	-0.047
		2	69	-0.003	0.036
		3	69	-0.003	-0.024
		4	69	-0.003	0.12
		5	69	-0.003	0
2	M6	1	34.091	-51.227	-417.641
		2	34.091	-51.227	-209.768
		3	34.091	-51.227	632
		4	34.091	-51.227	208.504
		5	34.091	-51.227	417.641
2	M7	1	0	0	0
		2	0	0	0
		3	0	0	0
		4	0	0	0
		5	0	0	0
2	M8	1	.004	0	0
		2	.004	0	0
		3	.004	0	0
		4	.004	0	0
		5	.004	0	0
2	M9	1	0	.004	0
		2	0	.004	0.12
		3	0	.004	-0.024
		4	0	.004	0.036
		5	0	.004	-0.047

# DESIGN OF ONE-BAY FRAMES @ 20'-0" OC AT 3RD FLOOR

FOR MOMENT FRAMES, MOMENTS ARE  
DEFORMATION-CONTROLLED:

$$M_{ud} = \cancel{M_G} \pm M_E \quad \dots \text{FEMA 273, Eq (3-14)}$$

0 (load directly to columns)

Expected Strength:

$$M_{ce} \geq M_{ud} / \gamma_2 \quad \dots \text{FEMA 273, Table 6-10}$$

(Immediate Occupancy, IO)

FOR MOMENT FRAMES, AXIAL and SHEAR FORCES  
ARE FORCE-CONTROLLED:

$$P_{uf} = P_G \pm \frac{P_E}{C_1 C_2 C_3 J}$$

$$V_{uf} = \cancel{V_G} \pm \frac{V_E}{C_1 C_2 C_3 J}$$

$$P_G = \left( \frac{1.1}{1.1} \right) \left( \frac{.0175}{.020 \times 2570} \right) (16.58 \times 20)$$

$$+ 1.1 \times .150 \times (1.33)^2 (G + 8.17)$$

$$= 12.3 \text{ k}$$

$$C_1 = 1.78$$

$$C_2 = 1$$

$$C_3 = 1$$

$$J = 1.0 + S \times S^{.6} = 1.6$$

$$P_{uf} = 12.3 \pm 0.49 P_E$$

DESCRIPTION

Mitsunaga &amp; Associates, Inc.

BY:

CHECKED

PROJECT:

QUAD C

JOB NO.

SHEET

DATE

OF

# DESIGN OF ONE-BAY FRAMES @ 20'-0" OC AT 3RD FLOOR

## BEAM FORCES (16" x 24")

For a 1 kip lateral load,  $M_{max} = 6 \text{ k-ft}$   
(see RISA-2D Output)  
 $V_{max} = 0.735 \text{ k}$

For flexible roof diaphragm  
in transverse direction,  
max. seismic force at 3rd Floor =  $2515 \text{ k}$   
(Bldg 356)

Load to frame based  
on trib area =  $2515 \times 20 / 364$   
=  $138 \text{ k}$

$M_{CE} \geq M_{UD}/m = 138 \times 6 / 2 = 415 \text{ k-ft}$  USE 419 k-ft (PO effects)  
 $V_{CE} \geq 0.49 V_E = 138 \times .49 \times .735 = 50.7 \text{ k}$  USE 51.2 k (PO effects)

check m:

$$V / (b w d \sqrt{F_c}) = 31.2 / (16 \times 21.5 \sqrt{4000 \times 1.25})$$

$$= 2.10 < 3 \text{ OK}$$

\* For non-conforming  
stirrups, with  
 $\rho = \rho'$ ,  $m = 2$

DESCRIPTION	<b>Mitsunaga &amp; Associates, Inc.</b>		BY:	CHECKED
	PROJECT: <u>QUAD C</u>		JOB NO.	SHEET OF
			DATE	

# DESIGN OF ONE-BAY FRAMES @ 20'-0" OC AT 3RD FLOOR (cont.)

Determine moment capacity  
of flexural members

$$\phi M_{ce} = A_s f_y^* (d - a/2)$$

where  $\phi = 1$  ..... FEMA 273, Sec 6.4.2.2

$$f_y^* = 1.25 F_y$$

$$f_c^* = 1.25 f_c' \dots \text{TI 809-05, Sec 5.2(4)a}$$

$d$  = depth

$$a = \frac{A_s f_y^*}{0.85 f_c^* b}$$

$$M_{ce} = M_{uo}/m$$

$$M_{uo}/m = A_s f_y^* (d - \frac{A_s f_y^*}{0.85 f_c^* b} \times 2)$$

Solve for  $A_s$ :

$$\therefore A_{s \text{ reqd}} = \frac{d - \sqrt{d^2 - \frac{2 \times M_{uo} \times 12}{0.85 f_c^* b m}}}{f_y^* / (0.85 f_c^* b)}$$

1-k to  
11-k

DESCRIPTION	Mitsunaga & Associates, Inc.	BY:	CHECKED
	PROJECT: QUAD C	JOB NO.	SHEET OF
		DATE	

# DESIGN OF ONE-BAY FRAMES @ 20'-0" OC AT 3RD FLOOR

## BEAM DESIGN (16" x 24")

$$b = 16"$$

$$d = 24 - 2.5 = 21.5"$$

$$m_{UD}/m = 415^{1-k}$$

$$f'_c * = 1.25 \times 4 = 5 \text{ ksi}$$

$$f_y * = 1.25 \times 60 = 75 \text{ ksi}$$

$$A_{s \text{ req'd}} = \frac{21.5 - \sqrt{21.5^2 - \frac{2(419 \times 12)}{1.85 \times 5 \times 16}}}{75 / (.85 \times 5 \times 16)}$$

$$= 3.42 \text{ in}^2$$

3 - #10 (T & B)  
or 4 - #9

$$V_{UF} \times .49 = 51.2 \text{ k}$$

$$V_c = 2 \sqrt{4000 \times 1.25} (16 \times 21.5) = 48.6 \text{ k}$$

∴ PROVIDE MIN REINFORCING (#4 @ 10" OC)

DESCRIPTION	Mitsunaga & Associates, Inc.		BY:	CHECKED
	PROJECT: <u>QUAD C</u>		JOB NO.	SHEET OF
			DATE	



# DESIGN OF ONE BAY FRAMES @ 20'-0" oc AT 3RD FLOOR

## COLUMN FORCES (16" x 24")

For a 1 kip lateral load,  $M_{max} = 6 \text{ k}$

$$V_{max} = 0.5 \text{ k}$$

$$P_{max} = 0.735 \text{ k}$$

For flexible roof diaphragm  
in transverse direction,

max seismic force at 3rd Floor = 2515 k

(Bldg 35G)

Load to frame based on trib area = 138 k

$$M_{CE} \geq M_{UD}/n = 138 \times 6/2 = 415 \text{ k}$$

$$V_{UF} \geq 0.49 V_e = 138 \times 0.49 \times 735 = 50.7 \text{ k}$$

Input to PE into  
RISA-2D

$$P_{UF} \geq P_{UF}/k = 12.3 + 0.49 (0.735 \times 138)$$

~ 1.0 (Knowledge Factor)

$$= 62.0 \text{ k}$$

~ 63.2 k (for PD effects)

DESCRIPTION	Mitsunaga & Associates, Inc.		BY:	CHECKED
	PROJECT: <u>QUAD C</u>		JOB NO.	SHEET OF
			DATE	

# DESIGN OF ONE-BAY FRAMES @ 20'-0" @ AT 3RD FLOOR

## COLUMN DESIGN (16" x 24")

From RISA-2D Output  
(Load Combination #2)

$$P = 63.2 \text{ k}, \quad \text{includes PD effects}$$

$$M = 418 \text{ k}$$

For short columns,

$$P_{UF} = 0.85 [0.85 f'_c (A_g - A_{st}) + f_y^* A_{st}]$$

$$\text{Where } f'_c^* = 1.25 \times 4 = 5 \text{ ksi}$$

$$f_y^* = 1.25 \times 60 = 75 \text{ ksi}$$

$$A_g = 16 \times 24 = 384 \text{ in}^2$$

$$A_{st} = 8 - \#10 = 10.16 \text{ in}^2$$

$$P_{UF} = 0.85 [0.85(5)(384 - 10.16) + 75(10.16)]$$

$$= 1998 \text{ k}$$

\* Since  $P/P_{UF} = 0.03$ , design column as a beam (moment only)  $\rightarrow$  conservative

DESCRIPTION	Mitsunaga & Associates, Inc.		BY:	CHECKED
	PROJECT: QUAD C		JOB NO.	SHEET OF
			DATE	

# DETERMINE EQUIVALENT WALL THICKNESS FOR CONCRETE FRAMES AT 3RD FLOOR

For 1 kip lateral load and

$$E = \frac{1}{2} E_c \quad (\text{effective stiffness per FEMA 273 Table 6-4})$$

$$\Delta = 0.03" \quad (\text{RSA-2D output for 1 kip load})$$

For 1 kip lateral load and

$$E = 0.8 E_c \quad (\text{per FEMA 273 Table 6-4})$$

$$\Delta = \frac{1}{8 \times 3122} \left( \frac{h}{6L} \right) \left[ \frac{4h^2}{L^2} + 2.64 \right]$$

thick
12'  
16.33'  
(middle bay)

$$= \frac{.0014}{b}$$

$$b_{equiv} = \frac{.0014}{0.03} = .047"$$

∴ USE 1/2" THICK TRANSVERSE WALLS  
(CONS.) FOR SHEAR DISTRIBUTION  
AT ROOF DIAPHRAGM\*.

\* DIAPHRAGM IS RIGID IN LONGITUDINAL  
DIRECTION !!!

DESCRIPTION	Mitsunaga & Associates, Inc.	BY:	CHECKED
	PROJECT: QUAD C	JOB NO.	SHEET OF
		DATE	







PROJ: QUAD C, BUILDING 355  
TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003  
TIME: 01:23 PM P.M.

$$V = C1 \cdot C2 \cdot C3 \cdot S_a \cdot W$$

$$T = C_t \cdot (h_n)^{3/4}$$

$$S_{xs} = 2/3 \cdot F_a \cdot S_s$$

$$S_{x1} = 2/3 \cdot F_v \cdot S_1$$

$$T_0 = (S_{x1} \cdot B_s / S_{xs} \cdot B_1)$$

SHORT PERIOD SPECTRAL RESPONSE ACCELERATION PARAMETER,  $S_s = 0.60$   
SPECTRAL RESPONSE ACCELERATION PARAMETER AT 1 SEC,  $S_1 = 0.17$

PERFORMANCE LEVEL [IO,SE,LS,CP] =	IO	$B_s =$	1.00
SOIL CLASS [A, B, C, D, E, F] =	E	$B_1 =$	1.00
% DAMPING =	5.000	$T_0 =$	0.62
SITE COEFFICIENT, $F_a =$	1.5	$C_1 =$	1.28
SITE COEFFICIENT, $F_v =$	3.3	$C_2 =$	1.00
$C_t$ FACTOR [0.035,0.030,0.020,0.060] =	0.020	$C_3 =$	1.00

DESIGN SHORT PERIOD RESPONSE ACCELERATION PARAMETER,  $S_{xs} = 0.60$   
DESIGN RESPONSE ACCELERATION PARAMETER AT 1 SEC,  $S_{x1} = 0.37$

RESPONSE SPECTRAL ACCELERATION (AT PERIOD T),  $S_a = 0.60$

TOTAL BUILDING HEIGHT = 41.66 FT  
BUILDING SEISMIC WEIGHT, W = 9769 KIPS

	T (SEC)	k	BASE V (KIPS)
LINEAR STATIC METHOD	0.33	1.00	7510.89

BASE SHEAR COEFFICIENT = 0.7688 x W  
TOTAL DESIGN BASE SHEAR = 7510.9 KIPS

Ct	LATERAL SYSTEM	%damping	$B_s$	$B_1$
0.035	Steel Moment Resisting Frames	2.00	0.80	0.80
0.030	RC Moment Resisting Frames	5.00	1.00	1.00
0.030	Eccentrically Braced Frames	10.00	1.20	1.20
0.020	All Other Buildings			
0.060	Wood Buildings			

PROJ: QUAD C, BUILDING 355  
TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003  
TIME: 01:23 PM P.M.

CLASS SITE DESCRIPTION - SOIL PROFILES

A HARD ROCK, SHEAR WAVE VELOCITY  $V_s > 5000$  FT/S.  
B ROCK, SHEAR WAVE VELOCITY  $V_s$  FROM 2500 TO 5000 FT/S.  
C VERY DENSE SOIL AND SOFT ROCK, SHEAR WAVE VELOCITY  
 $V_s$  FROM 1200 TO 2500 FT/S.  
D STIFF SOIL, SHEAR WAVE VELOCITY  $V_s$  FROM 600 TO 1200 FT/S.  
E SOFT SOIL, SHEAR WAVE VELOCITY  $V_s < 600$  FT/S.  
(ASSUME CLASS E IF NO INFORMATION IS AVAILABLE.)  
F SOIL REQUIRING SITE-SPECIFIC EVALUATION.

SITE COEFFICIENT,  $F_a$  (Based on Site Class & Spectral Response Acceleration  $S_s$ )

CLASS	SPECTRAL RESPONSE ACCELERATION, $S_s$				
	0.25	0.50	0.75	1.00	1.25
A	0.80	0.80	0.80	0.80	0.80
B	1.00	1.00	1.00	1.00	1.00
C	1.20	1.20	1.10	1.00	1.00
D	1.60	1.40	1.20	1.10	1.00
E	2.50	1.70	1.20	0.90	NA
F	NA	NA	NA	NA	NA

SITE COEFFICIENT,  $F_v$  (Based on Site Class & Spectral Response Acceleration  $S_1$ )

CLASS	SPECTRAL RESPONSE ACCELERATION, $S_1$				
	0.10	0.20	0.30	0.40	0.50
A	0.80	0.80	0.80	0.80	0.80
B	1.00	1.00	1.00	1.00	1.00
C	1.70	1.60	1.50	1.40	1.30
D	2.40	2.00	1.80	1.60	1.50
E	3.50	3.20	2.80	2.40	NA
F	NA	NA	NA	NA	NA



PROJ: QUAD C, BUILDING 355  
 TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003  
 TIME: 01:23 PM P.M.

INCH-POUND UNITS:

LEVEL	WEIGHT (kips)	DH (ft)	HEIGHT (ft)	W*H/1000 (ft-k)	FORCE (kips)	SHEAR (kips)	V*DH (ft-k)	MOMENT (ft-k)
	0		0.0	0	0.0			0
		0.0				0.0	0	
	0		0.0	0	0.0			0
		0.0				0.0	0	
ROOF	1845		41.7	77	2576.1			0
		16.5				2576.1	42506	
3RD	3780		25.2	95	3187.5			42506
		12.6				5763.7	72507	
2ND	4144		12.6	52	1747.2			115013
		12.6				7510.9	94487	
GRND				0	0.0			209500
	9769	41.7		224	7510.9		209500	

## SEISMIC WEIGHT DETERMINATION

PAGE 1

PROJECT: QUAD C, BUILDING 355 (w/ retrofit) DATE: 02/03/03  
 TITLE: ROOF TIME: 11:34 AM

FLOORS: (ROOF)	DESCRIPTION	WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (kips)
	ROOF	0.018	25054	438.45
		0.000	0	0.00
		0.000	0	0.00
		0.000	0	0.00

438.45

BEAMS: (ROOF)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	6.50	70.00	0.474	364.00	1.00	172.52
GRID B	8.00	10.00	0.083	364.00	1.00	30.33
GRID C	10.00	10.00	0.104	364.00	1.00	37.92
GRID D	10.00	10.00	0.104	364.00	1.00	37.92
GRID E	6.50	70.00	0.474	364.00	1.00	172.52
TRANS	10.00	10.00	0.104	60.83	19.00	120.39
TRANS-C to D	12.50	12.50	0.163	60.83	19.00	188.11
GRID 1, 20	6.50	70.00	0.474	50.00	2.00	47.40

807.11

COLUMNS: (ROOF)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	10.00	48.00	0.500	5.58	8.00	22.32
GRID C	16.00	16.00	0.267	5.58	19.00	28.27
GRID D	16.00	16.00	0.267	5.58	19.00	28.27
GRID E	4.00	10.00	0.042	5.58	19.00	4.42
GRID B	4.00	10.00	0.042	5.58	19.00	4.42
	0.00	0.00	0.000	0.00	0.00	0.00

87.70

WALLS: (ROOF)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (kips)
GRID B	7.18	150.00	0.090	364.00	5.58	182.29
GRID E	8.93	150.00	0.112	364.00	5.58	226.72
GRID A	8.00	150.00	0.100	34.83	5.58	19.44
GRID 1	12.00	150.00	0.150	50.00	5.58	41.85
GRID 20	12.00	150.00	0.150	50.00	5.58	41.85
GRID	0.00	150.00	0.000	50.00	5.58	0.00
GRID	0.00	150.00	0.000	50.00	5.58	0.00
GRID	0.00	150.00	0.000	50.00	5.58	0.00
GRID	0.00	150.00	0.000	0.00	5.58	0.00

512.15

FLOORS	438.45 kips
BEAMS	807.11 kips
COLUMNS	87.70 kips
WALLS	512.15 kips

1845.41 kips

## SEISMIC WEIGHT DETERMINATION

PAGE 2

PROJECT: QUAD C, BUILDING 355 (w/ retrofit) DATE: 02/03/03  
 TITLE: 3RD FL TIME: 11:34 AM

FLOORS: (3RD FL)	DESCRIPTION	WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (kips)
	TYPICAL FLOOR	0.101	18200	1838.20
	BALCONY	0.078	3942	307.49
	STAIRS (add to balcony)	0.092	253	23.26
	STAIRS (add to balcony)	0.092	217	19.93
				2188.87

BEAMS: (3RD FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	6.00	27.00	0.169	364.00	1.00	61.43
GRID C	12.00	14.00	0.175	364.00	1.00	63.70
GRID D	12.00	14.00	0.175	364.00	1.00	63.70
	0.00	0.00	0.000	0.00	0.00	0.00
	0.00	0.00	0.000	0.00	0.00	0.00
						188.83

COLUMNS: (3RD FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	10.00	48.00	0.500	5.58	8.00	22.32
GRID C	16.00	16.00	0.267	5.58	19.00	28.27
GRID D	16.00	16.00	0.267	5.58	19.00	28.27
GRID E	4.00	10.00	0.042	5.58	19.00	4.42
GRID B	4.00	10.00	0.042	5.58	19.00	4.42
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	10.00	0.042	6.04	19.00	4.78
GRID B	4.00	10.00	0.042	6.04	19.00	4.78
						149.06

WALLS: (3RD FL)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (kips)
GRID B	7.18	150.00	0.090	364.00	5.58	182.29
GRID E	8.93	150.00	0.112	364.00	5.58	226.72
GRID A	8.00	150.00	0.100	34.83	5.58	19.44
GRID 1	12.00	150.00	0.150	50.00	5.58	41.85
GRID 20	12.00	150.00	0.150	50.00	5.58	41.85
	0.00	150.00	0.000	0.00	0.00	0.00
GRID B	8.62	150.00	0.108	364.00	6.04	236.89
GRID E	10.42	150.00	0.130	364.00	6.04	286.36
GRID A	8.00	150.00	0.100	34.83	6.04	21.04
GRID 1	14.00	150.00	0.175	50.00	6.04	52.85
GRID 20	14.00	150.00	0.175	50.00	6.04	52.85
GRID 6	8.00	150.00	0.100	50.00	6.04	30.20
GRID 10.5	8.00	150.00	0.100	50.00	6.04	30.20
GRID 15	8.00	150.00	0.100	50.00	6.04	30.20
	8.00	150.00	0.100	0.00	0.00	0.00
	8.00	150.00	0.100	0.00	0.00	0.00
						1252.75

FLOORS	2188.87 kips
BEAMS	188.83 kips
COLUMNS	149.06 kips
WALLS	1252.75 kips

3779.50 kips

## SEISMIC WEIGHT DETERMINATION

PAGE 3

PROJECT: QUAD C, BUILDING 355 (w/ retrofit) DATE: 02/03/03  
 TITLE: 2ND FL TIME: 11:34 AM

FLOORS: (2ND FL)	DESCRIPTION	WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (kips)
	TYPICAL FLOOR	0.101	18200	1838.20
	BALCONY	0.078	3942	307.49
	STAIRS (add to balcony)	0.092	253	23.26
	STAIRS (add to balcony)	0.092	217	19.93

2188.87

BEAMS: (2ND FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	6.00	27.00	0.169	364.00	1.00	61.43
GRID C	12.00	14.00	0.175	364.00	1.00	63.70
GRID D	12.00	14.00	0.175	364.00	1.00	63.70
	0.00	0.00	0.000	0.00	0.00	0.00
	0.00	0.00	0.000	0.00	0.00	0.00

188.83

COLUMNS: (2ND FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	10.00	0.042	6.04	19.00	4.78
GRID B	4.00	10.00	0.042	6.04	19.00	4.78
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	10.00	0.042	6.04	19.00	4.78
GRID B	4.00	10.00	0.042	6.04	19.00	4.78
	0.00	0.00	0.000	0.00	0.00	0.00

122.73

WALLS: (2ND FL)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (kips)
GRID B	8.62	150.00	0.108	364.00	6.04	236.89
GRID E	10.42	150.00	0.130	364.00	6.04	286.36
GRID A	8.00	150.00	0.100	34.83	6.04	21.04
GRID 1	14.00	150.00	0.175	50.00	6.04	52.85
GRID 20	14.00	150.00	0.175	50.00	6.04	52.85
GRID 6	8.00	150.00	0.100	50.00	6.04	30.20
GRID 10.5	8.00	150.00	0.100	50.00	6.04	30.20
GRID 15	8.00	150.00	0.100	50.00	6.04	30.20
	0.00	150.00	0.000	0.00	0.00	0.00
GRID B	7.95	150.00	0.099	364.00	6.04	218.48
GRID E	13.17	150.00	0.165	364.00	6.04	361.94
GRID A	8.00	150.00	0.100	34.83	6.04	21.04
GRID 1	16.00	150.00	0.200	50.00	6.04	60.40
GRID 20	16.00	150.00	0.200	50.00	6.04	60.40
GRID 6	8.00	150.00	0.100	50.00	6.04	30.20
GRID 10	16.00	150.00	0.200	50.00	6.04	60.40
GRID 11	16.00	150.00	0.200	50.00	6.04	60.40
GRID 15	8.00	150.00	0.100	50.00	6.04	30.20
	0.00	150.00	0.000	0.00	0.00	0.00

1644.05

FLOORS	2188.87 kips
BEAMS	188.83 kips
COLUMNS	122.73 kips
WALLS	1644.05 kips

4144.48 kips

## CENTER OF MASS DETERMINATION

PAGE 1

PROJECT: QUAD C, BUILDING 355 (w/ retrofit)  
 TITLE: ROOF

DATE: 02/03/03  
 TIME: 11:34 AM

FLOORS: (ROOF)	DESCRIPTION	WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	ROOF	438.45	182.00	30.42	79797	13335
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

79797 13335

BEAMS: (ROOF)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	172.52	182.00	60.42	31399	10424
	GRID B	30.33	182.00	49.58	5521	1504
	GRID C	37.92	182.00	33.17	6901	1258
	GRID D	37.92	182.00	18.83	6901	638
	GRID E	172.52	182.00	0.42	31399	72
	TRANS	120.39	182.00	30.42	21911	3662
	TRANS-C to D	188.11	182.00	25.00	34237	4703
	GRID 1, 20	47.40	182.00	30.42	8626	1442

146894 23703

COLUMNS: (ROOF)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	22.32	182.00	60.42	4062	1349
	GRID C	28.27	182.00	33.17	5146	938
	GRID D	28.27	182.00	18.83	5146	476
	GRID E	4.42	182.00	0.67	804	3
	GRID B	4.42	182.00	49.33	804	218
		0.00	0.00	0.00	0	0

15961 2983

WALLS: (ROOF)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID B	182.29	182.00	49.67	33177	9054
	GRID E	226.72	182.00	0.33	41264	75
	GRID A	19.44	182.00	60.50	3537	1176
	GRID 1	41.85	182.00	25.00	7617	1046
	GRID 20	41.85	182.00	25.00	7617	1046
	GRID	0.00	182.00	25.00	0	0
	GRID	0.00	182.00	25.00	0	0
	GRID	0.00	182.00	25.00	0	0
		0.00	0.00	0.00	0	0

93212 12398

	WEIGHTX	WEIGHTY		
FLOORS	79797	13335	CENTER OF MASS X =	182.00
BEAMS	146894	23703	CENTER OF MASS Y =	28.41
COLUMNS	15961	2983		
WALLS	93212	12398		

335864.35 52418.95

13028

CENTER OF MASS DETERMINATION

PAGE 2

PROJECT: QUAD C, BUILDING 355 (w/ retrofit)  
TITLE: 3RD FL

DATE: 02/03/03  
TIME: 11:34 AM

FLOORS: (3RD FL)	DESCRIPTION	WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	TYPICAL FLOOR	1838.20	182.00	25.00	334552	45955
	BALCONY	307.49	182.00	55.42	55962	17039
	STAIRS (add to balcony)	23.26	182.00	55.42	4232	1289
	STAIRS (add to balcony)	19.93	131.67	58.12	2624	1158

397371 65441

BEAMS: (3RD FL)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	61.43	182.00	60.42	11179	3711
	GRID C	63.70	182.00	33.17	11593	2113
	GRID D	63.70	182.00	16.83	11593	1072
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

34366 6896

COLUMNS: (3RD FL)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	22.32	182.00	60.42	4082	1349
	GRID C	28.27	182.00	33.17	5146	938
	GRID D	28.27	182.00	16.83	5146	476
	GRID E	4.42	182.00	0.67	804	3
	GRID B	4.42	182.00	49.33	804	218
	GRID A	20.68	182.00	60.42	3764	1249
	GRID C	15.56	182.00	33.17	2832	518
	GRID D	15.56	182.00	16.83	2832	282
	GRID E	4.78	182.00	0.67	870	3
	GRID B	4.78	182.00	49.33	870	236

27130 5250

WALLS: (3RD FL)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID B	182.29	182.00	49.67	33177	9054
	GRID E	226.72	182.00	0.33	41264	75
	GRID A	19.44	182.00	60.50	3537	1176
	GRID 1	41.85	182.00	25.00	7617	1046
	GRID 20	41.85	182.00	25.00	7617	1046
		0.00	0.00	0.00	0	0
	GRID B	236.89	182.00	49.67	43115	11767
	GRID E	286.36	182.00	0.33	52118	94
	GRID A	21.04	182.00	60.50	3829	1273
	GRID 1	52.85	182.00	25.00	9619	1321
	GRID 20	52.85	182.00	25.00	9619	1321
	GRID 6	30.20	182.00	25.00	5496	755
	GRID 10.5	30.20	182.00	25.00	5496	755
	GRID 15	30.20	182.00	25.00	5496	755
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

WEIGHTX WEIGHTY

228000 30439

FLOORS	397371	65441
BEAMS	34366	6896
COLUMNS	27130	5250
WALLS	228000	30439

CENTER OF MASS X = 181.73  
CENTER OF MASS Y = 28.58

Total center of mass X = 181.82  
Total center of mass Y = 28.52

686866.69 108026.13

## CENTER OF MASS DETERMINATION

PAGE 3

PROJECT: QUAD C, BUILDING 355 (w/ retrofit)  
 TITLE: 2ND FL

DATE: 02/03/03  
 TIME: 11:34 AM

FLOORS: (2ND FL)	DESCRIPTION	WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	TYPICAL FLOOR	1838.20	182.00	25.00	334552	45955
	BALCONY	307.49	182.00	55.42	55962	17039
	STAIRS (add to balcony)	23.26	182.00	55.42	4232	1289
	STAIRS (add to balcony)	19.93	131.67	58.12	2624	1158

397371 65441

BEAMS: (2ND FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	61.43	182.00	60.42	11179	3711
	GRID C	63.70	182.00	33.17	11593	2113
	GRID D	63.70	182.00	16.83	11593	1072
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

34366 6896

COLUMNS: (2ND FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	20.88	182.00	60.42	3764	1249
	GRID C	15.56	182.00	33.17	2832	516
	GRID D	15.56	182.00	16.83	2832	262
	GRID E	4.78	182.00	0.67	870	3
	GRID B	4.78	182.00	49.33	870	236
	GRID A	20.88	182.00	60.42	3764	1249
	GRID C	15.56	182.00	33.17	2832	516
	GRID D	15.56	182.00	16.83	2832	262
	GRID E	4.78	182.00	0.67	870	3
	GRID B	4.78	182.00	49.33	870	236
		0.00	0.00	0.00	0	0

22337 4533

WALLS: (2ND FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID B	236.89	182.00	49.67	43115	11767
	GRID E	286.36	182.00	0.33	52118	94
	GRID A	21.04	182.00	60.50	3829	1273
	GRID 1	52.85	182.00	25.00	9619	1321
	GRID 20	52.85	182.00	25.00	9619	1321
	GRID 6	30.20	182.00	25.00	5496	755
	GRID 10.5	30.20	182.00	25.00	5496	755
	GRID 15	30.20	182.00	25.00	5496	755
		0.00	0.00	0.00	0	0
	GRID B	218.48	182.00	49.67	39764	10852
	GRID E	361.94	182.00	0.33	65873	119
	GRID A	21.04	182.00	60.50	3829	1273
	GRID 1	60.40	182.00	25.00	10993	1510
	GRID 20	60.40	182.00	25.00	10993	1510
	GRID 6	30.20	182.00	25.00	5496	755
	GRID 10	60.40	182.00	25.00	10993	1510
	GRID 11	60.40	182.00	25.00	10993	1510
	GRID 15	30.20	182.00	25.00	5496	755
		0.00	0.00	0.00	0	0

WEIGHTX WEIGHTY 299217 37836

FLOORS	397371	65441	CENTER OF MASS X =	181.76
BEAMS	34366	6896	CENTER OF MASS Y =	27.68
COLUMNS	22337	4533		
WALLS	299217	37836	Total center of mass X =	181.79
			Total center of mass Y =	28.16

753291.52 114706.25

## Rigid Diaphragm Torsional Analysis

Description QUAD C, BUILDING 355 -- 2ND FLOOR DIAPHRAGM (REV)

## General Information

Y-Y Axis Shear	7,511.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	181.79 ft
X-X Axis Shear	7,511.00 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	28.16 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	5.860	153.000	12.580	76.500	50.000	0.0	Fix-Fix	1.0
2	8.950	153.000	12.580	76.500	0.000	0.0	Fix-Fix	1.0
3	12.980	60.830	12.580	0.000	25.000	90.0	Fix-Fix	1.0
4	12.980	60.830	12.580	363.330	25.000	90.0	Fix-Fix	1.0
5	7.130	50.000	12.580	91.670	25.000	90.0	Fix-Fix	1.0
6	16.000	50.000	12.580	171.670	25.000	90.0	Fix-Fix	1.0
7	16.000	50.000	12.580	191.670	25.000	90.0	Fix-Fix	1.0
8	8.000	50.000	12.580	271.670	25.000	90.0	Fix-Fix	1.0
9	5.860	153.000	12.580	286.830	50.000	0.0	Fix-Fix	1.0
10	8.950	153.000	12.580	286.830	0.000	0.0	Fix-Fix	1.0
11	10.590	20.000	12.580	10.000	60.830	0.0	Fix-Fix	1.0
12	9.100	20.000	12.580	353.330	60.830	0.0	Fix-Fix	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	8.489	1,358.590	25.444	1,384.033
2	8.489	2,074.979	-32.346	2,074.979
3	-18.983	1,499.463	330.836	1,830.299
4	17.350	1,499.463	299.248	1,798.711
5	-18.983	671.879	73.823	745.702
6	-18.983	1,507.724	19.924	1,527.648
7	17.350	1,507.724	15.090	1,522.814
8	17.350	753.862	74.143	828.005
9	8.489	1,358.590	25.444	1,384.033
10	8.489	2,074.979	-32.346	2,074.979
11	8.489	279.827	7.321	287.148
12	8.489	240.456	6.291	246.746

## Summary

X Distance to Center of Rigidity	182.607 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear	
Y Distance to Center of Rigidity	22.713 ft	Xcm + .05*Max-X - X-cr =	17.350 ft Torsion = 130313.81 k-ft
		Xcm - .05*Max-X - X-cr =	-18.983 ft Torsion = -142583.35 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear	
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr =	8.489 ft Torsion = 63,757.22 k-ft
		Ycm - .05*Max-Y - Y-cr =	2.406 ft Torsion = 18,067.80 k-ft



**Rigid Diaphragm Torsional Analysis****Description** QUAD C, BUILDING 355 -- 3RD FLOOR DIAPHRAGM**General Information**

Y-Y Axis Shear	5,764.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	181.82 ft
X-X Axis Shear	5,764.00 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	28.52 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

**Wall Data**

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	4.380	363.330	12.580	182.000	50.000	0.0	Fix-Fix	1.0
2	6.560	363.330	12.580	182.000	0.000	0.0	Fix-Fix	1.0
3	9.880	60.830	12.580	0.000	25.000	90.0	Fix-Fix	1.0
4	9.880	60.830	12.580	363.330	25.000	90.0	Fix-Fix	1.0
5	7.500	50.000	12.580	90.750	25.000	90.0	Fix-Fix	1.0
6	8.000	50.000	12.580	181.670	25.000	90.0	Fix-Fix	1.0
7	8.000	50.000	12.580	271.670	25.000	90.0	Fix-Fix	1.0
8	7.150	20.000	12.580	10.000	60.830	0.0	Fix-Fix	1.0
9	7.150	20.000	12.580	353.330	60.830	0.0	Fix-Fix	1.0

**Calculated Wall Forces**

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	9.126	2,160.614	47.996	2,208.611
2	9.126	3,235.989	-58.511	3,235.989
3	-18.809	1,452.245	243.475	1,695.719
4	17.524	1,452.245	224.867	1,677.111
5	-18.809	899.259	75.780	975.039
6	-18.809	959.210	0.698	959.908
7	17.524	959.210	73.256	1,032.465
8	9.126	168.923	5.227	174.150
9	9.126	168.923	5.227	174.150

**Summary**

X Distance to Center of Rigidity	182.462 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear	
Y Distance to Center of Rigidity	22.436 ft	Xcm + .05*Max-X - X-cr = 17.524 ft	Torsion = 101010.17 k-ft
		Xcm - .05*Max-X - X-cr = -18.809 ft	Torsion = -108413.24 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear	
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr = 9.126 ft	Torsion = 52,599.82 k-ft
		Ycm - .05*Max-Y - Y-cr = 3.043 ft	Torsion = 17,537.41 k-ft

## Rigid Diaphragm Torsional Analysis

Description QUAD C, BUILDING 355 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

## General Information

Y-Y Axis Shear	0.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	182.00 ft
X-X Axis Shear	2,576.00 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	28.41 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	3.660	363.330	12.580	182.000	50.000	0.0	Fix-Pin	1.0
2	5.630	363.330	12.580	182.000	0.000	0.0	Fix-Pin	1.0
3	8.600	60.830	12.580	0.000	25.000	90.0	Fix-Pin	1.0
4	8.600	60.830	12.580	363.330	25.000	90.0	Fix-Pin	1.0
5	0.500	20.000	12.580	15.670	25.000	90.0	Fix-Pin	1.0
6	0.500	20.000	12.580	35.670	25.000	90.0	Fix-Pin	1.0
7	0.500	20.000	12.580	55.670	25.000	90.0	Fix-Pin	1.0
8	0.500	20.000	12.580	75.670	25.000	90.0	Fix-Pin	1.0
9	0.500	20.000	12.580	90.750	25.000	90.0	Fix-Pin	1.0
10	0.500	20.000	12.580	106.330	25.000	90.0	Fix-Pin	1.0
11	0.500	20.000	12.580	126.330	25.000	90.0	Fix-Pin	1.0
12	0.500	20.000	12.580	146.330	25.000	90.0	Fix-Pin	1.0
13	0.500	20.000	12.580	166.330	25.000	90.0	Fix-Pin	1.0
14	0.500	20.000	12.580	181.920	25.000	90.0	Fix-Pin	1.0
15	0.500	20.000	12.580	197.000	25.000	90.0	Fix-Pin	1.0
16	0.500	20.000	12.580	217.000	25.000	90.0	Fix-Pin	1.0
17	0.500	20.000	12.580	237.000	25.000	90.0	Fix-Pin	1.0
18	0.500	20.000	12.580	257.000	25.000	90.0	Fix-Pin	1.0
19	0.500	20.000	12.580	272.580	25.000	90.0	Fix-Pin	1.0
20	0.500	20.000	12.580	287.660	25.000	90.0	Fix-Pin	1.0
21	0.500	20.000	12.580	307.660	25.000	90.0	Fix-Pin	1.0
22	0.500	20.000	12.580	327.660	25.000	90.0	Fix-Pin	1.0
23	0.500	20.000	12.580	347.660	25.000	90.0	Fix-Pin	1.0
24	6.690	20.000	12.580	10.000	60.830	0.0	Fix-Pin	1.0
25	6.690	20.000	12.580	353.330	60.830	0.0	Fix-Pin	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	9.805	966.249	26.478	992.727
2	9.805	1,486.333	-31.096	1,486.333
3	9.805	0.814	61.985	62.799
4	9.805	0.814	61.984	62.798
5	9.805	0.000	0.730	0.730
6	9.805	0.000	0.642	0.642
7	9.805	0.000	0.554	0.554
8	9.805	0.000	0.466	0.466
9	9.805	0.000	0.400	0.400
10	9.805	0.000	0.331	0.331
11	9.805	0.000	0.243	0.243

Title : QUAD C

Job # 13033

Dsgnr:

Date:

Description : Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d

Scope : Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.

Rev: 506001

## Rigid Diaphragm Torsional Analysis

Page 2

## Description QUAD C, BUILDING 355 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

12	9.805	0.000	0.155	0.155
13	9.805	0.000	0.067	0.067
14	9.805	0.000	0.001	0.001
15	9.805	0.000	0.067	0.067
16	9.805	0.000	0.155	0.155
17	9.805	0.000	0.243	0.243
18	9.805	0.000	0.331	0.331
19	9.805	0.000	0.400	0.400
20	9.805	0.000	0.466	0.466
21	9.805	0.000	0.554	0.554
22	9.805	0.000	0.642	0.642
23	9.805	0.000	0.730	0.730
24	9.805	60.895	2.306	63.201
25	9.805	60.895	2.306	63.201

## Summary

X Distance to Center of Rigidity	181.667 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear		
Y Distance to Center of Rigidity	21.647 ft	Xcm + .05*Max-X - X-cr =	18.499 ft	Torsion = 0.00 k-ft
		Xcm - .05*Max-X - X-cr =	-17.834 ft	Torsion = 0.00 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear		
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr =	9.805 ft	Torsion = 25,257.48 k-ft
		Ycm - .05*Max-Y - Y-cr =	3.722 ft	Torsion = 9,587.67 k-ft

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 02/04/03  
TIME: 08:43 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR FRONT WALL (ONE SIDE OF BREEZEWAY)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	12.58	153.00	0.082	162339	0	162339	NA
SOLID STRIP	FIXED	12.00	10.00	153.00	0.085	204403	0	204403	NA
PIER (1-3)	FIXED				0.000	0	21321	21321	0.242
PIER (4-6)	FIXED				0.000	0	21321	21321	0.242
PIER 5	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.031
PIER 6	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.031
PIER 7	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.031
PIER 8	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.031
PIER 9	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.031
PIER 10	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.031
PIER 11	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.031
PIER 12	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.031
PIER 13	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.031
PIER 14	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.031
PIER (15-17)	FIXED				0.000	0	17995	17995	0.204
				L <sub>remain</sub> =	88.00	TOTAL (PIERS ONLY) =		88184	1.000
				THK <sub>red</sub> =	7.95	WALL RIGIDITY =		79317	(K/IN)

WALL PORTION: PIER (1-3)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	25.00	0.400	31642	0	31642	NA
SOLID STRIP	FIXED	12.00	4.50	25.00	0.180	73483	0	73483	NA
PIER 1	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.333
PIER 2	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.333
PIER 3	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.333
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
				L <sub>remain</sub> =	10.00	TOTAL (PIERS ONLY) =		34593	1.000
						WALL RIGIDITY =		21321	(K/IN)

WALL PORTION: PIER (4-6)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	25.00	0.400	31642	0	31642	NA
SOLID STRIP	FIXED	12.00	4.50	25.00	0.180	73483	0	73483	NA
PIER 4	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.333
PIER 5	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.333
PIER 6	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.333
					0.000	0	0	0	0.000
				L <sub>remain</sub> =	15.00	TOTAL (PIERS ONLY) =		34593	1.000
						WALL RIGIDITY =		21321	(K/IN)

WALL PORTION: PIER (15-17)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	23.00	0.435	28828	0	28828	NA
SOLID STRIP	FIXED	12.00	4.50	23.00	0.196	67465	0	67465	NA
PIER 15	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.412
PIER 16	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.412
PIER 17	FIXED	12.00	4.50	3.00	1.500	4946	0	4946	0.177
Lremain =				13.00	TOTAL (PIERS ONLY) =			28008	1.000
					WALL RIGIDITY =			17995	(K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	5.86	12.58	153.00	0.082	79275	0	79275	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			79275	(K/IN)

WALL PORTION: WALL AT FIRE CONTROL

*Equiv. Solid Thk = 9.1"*

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	12.58	20.00	0.629	18638	0	18638	NA
SOLID STRIP	FIXED	12.00	4.50	20.00	0.225	58411	0	58411	NA
PIER F1	FIXED	12.00	4.50	3.17	1.420	5481	0	5481	0.188
PIER F2	FIXED	12.00	4.50	7.00	0.643	18137	0	18137	0.623
PIER F3	FIXED	12.00	4.50	3.17	1.420	5481	0	5481	0.188
Lremain =				13.34	TOTAL (PIERS ONLY) =			29098	1.000
					WALL RIGIDITY =			14105	(K/IN)

WALL PORTION: WALL AT FIRE CONTROL

*Equiv. Solid Thk = 10.59"*

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	12.58	20.00	0.629	18638	0	18638	NA
SOLID STRIP	FIXED	12.00	4.50	20.00	0.225	58411	0	58411	NA
PIER C1	FIXED	12.00	4.50	7.75	0.581	20567	0	20567	0.500
PIER C2	FIXED	12.00	4.50	7.75	0.581	20567	0	20567	0.500
					0.000	0	0	0	0.000
Lremain =				15.50	TOTAL (PIERS ONLY) =			41134	1.000
					WALL RIGIDITY =			16436	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 05/16/03  
TIME: 08:21 AM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH\*1.25, F<sub>c</sub> OR F<sub>m</sub> = 3750 PSI

REINFORCING STRENGTH\*1.25, F<sub>y</sub> 75000 PSI  
SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1384 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

## WALL PORTION: GROUND FLOOR FRONT WALL (ONE SIDE OF BREEZEWAY)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1384.00	12.00	1830.00	5379.08	17410.7	0.78
PIER (1-3)	0.242	334.6	12.00	297.00	873.00	3346.2	0.90
PIER (4-6)	0.242	334.6	12.00	297.00	873.00	3346.2	0.90
PIER 5	0.031	43.2	12.00	57.00	167.55	432.3	0.61
PIER 6	0.031	43.2	12.00	57.00	167.55	432.3	0.61
PIER 7	0.031	43.2	12.00	57.00	167.55	432.3	0.61
PIER 8	0.031	43.2	12.00	57.00	167.55	432.3	0.61
PIER 9	0.031	43.2	12.00	57.00	167.55	432.3	0.61
PIER 10	0.031	43.2	12.00	57.00	167.55	432.3	0.61
PIER 11	0.031	43.2	12.00	57.00	167.55	432.3	0.61
PIER 12	0.031	43.2	12.00	57.00	167.55	432.3	0.61
PIER 13	0.031	43.2	12.00	57.00	167.55	432.3	0.61
PIER 14	0.031	43.2	12.00	57.00	167.55	432.3	0.61
PIER (15-17)	0.204	282.4	12.00	273.00	802.45	2824.2	0.83

1384.0

## WALL PORTION: PIER (1-3)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 1	0.333	111.5	12.00	57.00	167.55	250.96	0.35
PIER 2	0.333	111.5	12.00	57.00	167.55	250.96	0.35
PIER 3	0.333	111.5	12.00	57.00	167.55	250.96	0.35
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

334.6

## WALL PORTION: PIER (4-6)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 4	0.333	111.5	12.00	57.00	167.55	250.96	0.35
PIER 5	0.333	111.5	12.00	57.00	167.55	250.96	0.35
PIER 6	0.333	111.5	12.00	57.00	167.55	250.96	0.35
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

334.6

WALL PORTION: PIER (15-17)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 15	0.412	116.3	12.00	57.00	167.55	261.62	0.37
PIER 16	0.412	116.3	12.00	57.00	167.55	261.62	0.37
PIER 17	0.177	49.9	12.00	33.00	97.00	112.21	0.27
	1.000	282.4					

WALL PORTION: WALL AT FIRE CONTROL TOTAL WALL SHEAR = 287.1 KIPS

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER F1	0.188	54.1	12.00	35.04	103.00	121.67	0.28
PIER F2	0.623	178.9	12.00	81.00	238.09	402.63	0.40
PIER F3	0.188	54.1	12.00	35.04	103.00	121.67	0.28
		287.1					

WALL PORTION: WALL AT FIRE CONTROL TOTAL WALL SHEAR = 246.7 KIPS

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER C1	0.500	123.4	12.00	90.00	264.54	277.54	0.25
PIER C2	0.500	123.4	12.00	90.00	264.54	277.54	0.25
	0.000	0.0		0.00	0.00	0.00	0.00
		246.7					

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 02/04/03  
TIME: 08:35 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH,  $F'_c$  OR  $F'_m$  = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR FRONT WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	12.58	363.33	0.035	386272	0	386272	NA
SOLID STRIP	FIXED	12.00	10.00	363.33	0.028	486007	0	486007	NA
PIER (1-3)	FIXED				0.000	0	15714	15714	0.103
PIER (4-6)	FIXED				0.000	0	15714	15714	0.103
PIER 7	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.018
PIER (8-9)	FIXED				0.000	0	9893	9893	0.065
PIER 10	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.018
PIER 11	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.018
PIER 12	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.018
PIER (13-19)	FIXED				0.000	0	37947	37947	0.249
PIER 20	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.018
PIER 21	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.018
PIER (22-23)	FIXED				0.000	0	9893	9893	0.065
PIER 24	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.018
PIER (25-26)	FIXED				0.000	0	9893	9893	0.065
PIER 27	FIXED	12.00	10.00	5.00	2.000	2755	0	2755	0.018
PIER (28-30)	FIXED				0.000	0	15714	15714	0.103
PIER (31-33)	FIXED				0.000	0	15714	15714	0.103

Lremain = 165.00 TOTAL (PIERS ONLY) = 152523 1.000  
THKred = 8.62 WALL RIGIDITY = 141090 (K/IN)

WALL PORTION: PIER (1-3)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	25.00	0.400	31642	0	31642	NA
SOLID STRIP	FIXED	12.00	6.50	25.00	0.260	50249	0	50249	NA
PIER 1	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.333
PIER 2	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.333
PIER 3	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.333
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

Lremain = 15.00 TOTAL (PIERS ONLY) = 19255 1.000  
WALL RIGIDITY = 15714 (K/IN)

WALL PORTION: PIER (4-6)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	25.00	0.400	31642	0	31642	NA
SOLID STRIP	FIXED	12.00	6.50	25.00	0.260	50249	0	50249	NA
PIER 4	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.333
PIER 5	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.333
PIER 6	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.333
					0.000	0	0	0	0.000

Lremain = 15.00 TOTAL (PIERS ONLY) = 19255 1.000  
WALL RIGIDITY = 15714 (K/IN)



## WALL PORTION: PIER (8-9)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	15.00	0.667	17321	0	17321	NA
SOLID STRIP	FIXED	12.00	6.50	15.00	0.433	28937	0	28937	NA
PIER 8	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.500
PIER 9	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
Lremain =				10.00	TOTAL (PIERS ONLY) =			12837	1.000
					WALL RIGIDITY =			9893	(K/IN)

## WALL PORTION: PIER (13-19)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	65.00	0.154	86242	0	86242	NA
SOLID STRIP	FIXED	12.00	6.50	65.00	0.100	133325	0	133325	NA
PIER 13	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.143
PIER 14	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.143
PIER 15	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.143
PIER 16	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.143
PIER 17	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.143
PIER 18	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.143
PIER 19	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.143
					0.000	0	0	0	0.000
Lremain =				35.00	TOTAL (PIERS ONLY) =			44929	1.000
					WALL RIGIDITY =			37947	(K/IN)

## WALL PORTION: PIER (22-23)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	15.00	0.667	17321	0	17321	NA
SOLID STRIP	FIXED	12.00	6.50	15.00	0.433	28937	0	28937	NA
PIER 22	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.500
PIER 23	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
Lremain =				10.00	TOTAL (PIERS ONLY) =			12837	1.000
					WALL RIGIDITY =			9893	(K/IN)

## WALL PORTION: PIER (25-26)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	15.00	0.667	17321	0	17321	NA
SOLID STRIP	FIXED	12.00	6.50	15.00	0.433	28937	0	28937	NA
PIER 25	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.500
PIER 26	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
Lremain =				10.00	TOTAL (PIERS ONLY) =			12837	1.000
					WALL RIGIDITY =			9893	(K/IN)

## WALL PORTION: PIER (28-30)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	25.00	0.400	31642	0	31642	NA
SOLID STRIP	FIXED	12.00	6.50	25.00	0.260	50249	0	50249	NA
PIER 28	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.333
PIER 29	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.333
PIER 30	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.333
Lremain =				15.00	TOTAL (PIERS ONLY) =			19255	1.000
					WALL RIGIDITY =			15714	(K/IN)

## WALL PORTION: PIER (31-33)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	25.00	0.400	31642	0	31642	NA
SOLID STRIP	FIXED	12.00	6.50	25.00	0.260	50249	0	50249	NA
PIER 31	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.333
PIER 32	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.333
PIER 33	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.333
Lremain =				15.00	TOTAL (PIERS ONLY) =			19255	1.000
					WALL RIGIDITY =			15714	(K/IN)

## WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	4.38	12.58	363.33	0.035	140989	0	140989	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
TOTAL (PIERS ONLY) =								0	0.000
WALL RIGIDITY =								140989	(K/IN)

## WALL PORTION: WALL AT OFFICES

*Equiv. Solid Thk = 7.15"*

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	12.58	20.00	0.629	18638	0	18638	NA
SOLID STRIP	FIXED	12.00	6.50	20.00	0.325	39673	0	39673	NA
PIER C1	FIXED	12.00	6.50	3.17	2.050	2608	0	2608	0.161
PIER C2	FIXED	12.00	6.50	7.00	0.929	11017	0	11017	0.679
PIER C3	FIXED	12.00	6.50	3.17	2.050	2608	0	2608	0.161
Lremain =				13.34	TOTAL (PIERS ONLY) =			16234	1.000
					WALL RIGIDITY =			11105	(K/IN)

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 02/04/03  
TIME: 10:52 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2209 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION:	2ND FLOOR FRONT WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	2209.00	12.00	4353.96	12797.98	27789.2	0.51
PIER (1-3)	0.103	227.6	12.00	297.00	873.00	2275.9	0.61
PIER (4-6)	0.103	227.6	12.00	297.00	873.00	2275.9	0.61
PIER 7	0.018	39.9	12.00	57.00	167.55	399.0	0.57
PIER (8-9)	0.065	143.3	12.00	177.00	520.27	1432.9	0.65
PIER 10	0.018	39.9	12.00	57.00	167.55	399.0	0.57
PIER 11	0.018	39.9	12.00	57.00	167.55	399.0	0.57
PIER 12	0.018	39.9	12.00	57.00	167.55	399.0	0.57
PIER (13-19)	0.249	549.6	12.00	777.00	2283.90	5496.0	0.57
PIER 20	0.018	39.9	12.00	57.00	167.55	399.0	0.57
PIER 21	0.018	39.9	12.00	57.00	167.55	399.0	0.57
PIER (22-23)	0.065	143.3	12.00	177.00	520.27	1432.9	0.65
PIER 24	0.018	39.9	12.00	57.00	167.55	399.0	0.57
PIER (25-26)	0.065	143.3	12.00	177.00	520.27	1432.9	0.65
PIER 27	0.018	39.9	12.00	57.00	167.55	399.0	0.57
PIER (28-30)	0.103	227.6	12.00	297.00	873.00	2275.9	0.61
PIER (31-33)	0.103	227.6	12.00	297.00	873.00	2275.9	0.61

2209.0

WALL PORTION:	PIER (1-3)						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 1	0.333	75.9	12.00	57.00	167.55	246.56	0.35
PIER 2	0.333	75.9	12.00	57.00	167.55	246.56	0.35
PIER 3	0.333	75.9	12.00	57.00	167.55	246.56	0.35
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

227.6

WALL PORTION:	PIER (4-6)						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 4	0.333	75.9	12.00	57.00	167.55	246.56	0.35
PIER 5	0.333	75.9	12.00	57.00	167.55	246.56	0.35
PIER 6	0.333	75.9	12.00	57.00	167.55	246.56	0.35
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

227.6



WALL PORTION: PIER (28-30)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 28	0.333	75.9	12.00	57.00	167.55	246.56	0.35
PIER 29	0.333	75.9	12.00	57.00	167.55	246.56	0.35
PIER 30	0.333	75.9	12.00	57.00	167.55	246.56	0.35
	1.000	227.6					

WALL PORTION: PIER (31-33)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 31	0.333	75.9	12.00	57.00	167.55	246.56	0.35
PIER 32	0.333	75.9	12.00	57.00	167.55	246.56	0.35
PIER 33	0.333	75.9	12.00	57.00	167.55	246.56	0.35
	1.000	227.6					

WALL PORTION: WALL AT OFFICES

TOTAL WALL SHEAR = 174.2 KIPS

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER C1	0.161	28.0	12.00	35.04	103.00	90.97	0.21
PIER C2	0.679	118.2	12.00	81.00	238.09	384.21	0.38
PIER C3	0.161	28.0	12.00	35.04	103.00	90.97	0.21
		174.2					

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 02/04/03  
TIME: 08:38 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: 3RD FLOOR FRONT WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	10.00	12.58	363.33	0.035	321481	0	321481	NA
SOLID STRIP	FIXED	10.00	10.00	363.33	0.028	405006	0	405006	NA
PIER (1-3)	FIXED				0.000	0	13095	13095	0.103
PIER (4-6)	FIXED				0.000	0	13095	13095	0.103
PIER 7	FIXED	10.00	10.00	5.00	2.000	2296	0	2296	0.018
PIER (8-9)	FIXED				0.000	0	8245	8245	0.065
PIER 10	FIXED	10.00	10.00	5.00	2.000	2296	0	2296	0.018
PIER 11	FIXED	10.00	10.00	5.00	2.000	2296	0	2296	0.018
PIER 12	FIXED	10.00	10.00	5.00	2.000	2296	0	2296	0.018
PIER (13-19)	FIXED				0.000	0	31623	31623	0.249
PIER 20	FIXED	10.00	10.00	5.00	2.000	2296	0	2296	0.018
PIER 21	FIXED	10.00	10.00	5.00	2.000	2296	0	2296	0.018
PIER (22-23)	FIXED				0.000	0	8245	8245	0.065
PIER 24	FIXED	10.00	10.00	5.00	2.000	2296	0	2296	0.018
PIER (25-26)	FIXED				0.000	0	8245	8245	0.065
PIER 27	FIXED	10.00	10.00	5.00	2.000	2296	0	2296	0.018
PIER (28-30)	FIXED				0.000	0	13095	13095	0.103
PIER (31-33)	FIXED				0.000	0	13095	13095	0.103
			L <sub>remain</sub> =	165.00	TOTAL (PIERS ONLY) =			127102	1.000
			THK <sub>red</sub> =	7.18	WALL RIGIDITY =			117520	(K/IN)

WALL PORTION: PIER (1-3)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	25.00	0.400	26368	0	26368	NA
SOLID STRIP	FIXED	10.00	6.50	25.00	0.260	41874	0	41874	NA
PIER 1	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.333
PIER 2	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.333
PIER 3	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.333
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
			L <sub>remain</sub> =	15.00	TOTAL (PIERS ONLY) =			16046	1.000
					WALL RIGIDITY =			13095	(K/IN)

WALL PORTION: PIER (4-6)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	25.00	0.400	26368	0	26368	NA
SOLID STRIP	FIXED	10.00	6.50	25.00	0.260	41874	0	41874	NA
PIER 4	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.333
PIER 5	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.333
PIER 6	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.333
					0.000	0	0	0	0.000
			L <sub>remain</sub> =	15.00	TOTAL (PIERS ONLY) =			16046	1.000
					WALL RIGIDITY =			13095	(K/IN)

WALL PORTION: PIER (8-9)

13045

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	15.00	0.667	14434	0	14434	NA
SOLID STRIP	FIXED	10.00	6.50	15.00	0.433	24114	0	24114	NA
PIER 8	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.500
PIER 9	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
Lremain =				10.00	TOTAL (PIERS ONLY) =			10697	1.000
					WALL RIGIDITY =			8245	(K/IN)

WALL PORTION: PIER (13-19)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	65.00	0.154	71868	0	71868	NA
SOLID STRIP	FIXED	10.00	6.50	65.00	0.100	111104	0	111104	NA
PIER 13	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.143
PIER 14	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.143
PIER 15	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.143
PIER 16	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.143
PIER 17	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.143
PIER 18	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.143
PIER 19	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.143
					0.000	0	0	0	0.000
Lremain =				35.00	TOTAL (PIERS ONLY) =			37441	1.000
					WALL RIGIDITY =			31623	(K/IN)

WALL PORTION: PIER (22-23)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	15.00	0.667	14434	0	14434	NA
SOLID STRIP	FIXED	10.00	6.50	15.00	0.433	24114	0	24114	NA
PIER 22	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.500
PIER 23	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
Lremain =				10.00	TOTAL (PIERS ONLY) =			10697	1.000
					WALL RIGIDITY =			8245	(K/IN)

WALL PORTION: PIER (25-26)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	15.00	0.667	14434	0	14434	NA
SOLID STRIP	FIXED	10.00	6.50	15.00	0.433	24114	0	24114	NA
PIER 25	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.500
PIER 26	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
Lremain =				10.00	TOTAL (PIERS ONLY) =			10697	1.000
					WALL RIGIDITY =			8245	(K/IN)

WALL PORTION: PIER (28-30)

3046

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	25.00	0.400	26368	0	26368	NA
SOLID STRIP	FIXED	10.00	6.50	25.00	0.260	41874	0	41874	NA
PIER 28	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.333
PIER 29	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.333
PIER 30	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.333
Lremain =				15.00	TOTAL (PIERS ONLY) =			16046	1.000
					WALL RIGIDITY =			13095	(K/IN)

WALL PORTION: PIER (31-33)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	25.00	0.400	26368	0	26368	NA
SOLID STRIP	FIXED	10.00	6.50	25.00	0.260	41874	0	41874	NA
PIER 31	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.333
PIER 32	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.333
PIER 33	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.333
Lremain =				15.00	TOTAL (PIERS ONLY) =			16046	1.000
					WALL RIGIDITY =			13095	(K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	3.66	12.58	363.33	0.035	117662	0	117662	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
TOTAL (PIERS ONLY) =								0	0.000
WALL RIGIDITY =								117662	(K/IN)

WALL PORTION: WALL AT OFFICES

Equiv. Solid Tak = 6.69'

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	10.00	12.58	20.00	0.629	11325	0	11325	NA
SOLID STRIP	FIXED	10.00	6.50	20.00	0.325	33061	0	33061	NA
PIER C1	FIXED	10.00	6.50	3.17	2.050	2174	0	2174	0.161
PIER C2	FIXED	10.00	6.50	7.00	0.929	9181	0	9181	0.679
PIER C3	FIXED	10.00	6.50	3.17	2.050	2174	0	2174	0.161
Lremain =				13.34	TOTAL (PIERS ONLY) =			13528	1.000
					WALL RIGIDITY =			7578	(K/IN)



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 02/04/03  
TIME: 10:48 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI  
SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 993 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 3RD FLOOR FRONT WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	993.00	10.00	4353.96	10664.98	12491.9	0.23
PIER (1-3)	0.103	102.3	10.00	297.00	727.50	1023.1	0.28
PIER (4-6)	0.103	102.3	10.00	297.00	727.50	1023.1	0.28
PIER 7	0.018	17.9	10.00	57.00	139.62	179.3	0.25
PIER (8-9)	0.065	64.4	10.00	177.00	433.56	644.1	0.29
PIER 10	0.018	17.9	10.00	57.00	139.62	179.3	0.25
PIER 11	0.018	17.9	10.00	57.00	139.62	179.3	0.25
PIER 12	0.018	17.9	10.00	57.00	139.62	179.3	0.25
PIER (13-19)	0.249	247.1	10.00	777.00	1903.25	2470.8	0.25
PIER 20	0.018	17.9	10.00	57.00	139.62	179.3	0.25
PIER 21	0.018	17.9	10.00	57.00	139.62	179.3	0.25
PIER (22-23)	0.065	64.4	10.00	177.00	433.56	644.1	0.29
PIER 24	0.018	17.9	10.00	57.00	139.62	179.3	0.25
PIER (25-26)	0.065	64.4	10.00	177.00	433.56	644.1	0.29
PIER 27	0.018	17.9	10.00	57.00	139.62	179.3	0.25
PIER (28-30)	0.103	102.3	10.00	297.00	727.50	1023.1	0.28
PIER (31-33)	0.103	102.3	10.00	297.00	727.50	1023.1	0.28

993.0

WALL PORTION: PIER (1-3)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 1	0.333	34.1	10.00	57.00	139.62	110.83	0.16
PIER 2	0.333	34.1	10.00	57.00	139.62	110.83	0.16
PIER 3	0.333	34.1	10.00	57.00	139.62	110.83	0.16
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

102.3

WALL PORTION: PIER (4-6)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 4	0.333	34.1	10.00	57.00	139.62	110.83	0.16
PIER 5	0.333	34.1	10.00	57.00	139.62	110.83	0.16
PIER 6	0.333	34.1	10.00	57.00	139.62	110.83	0.16
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

102.3

## WALL PORTION: PIER (8-9)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 8	0.500	32.2	10.00	57.00	139.62	104.67	0.15
PIER 9	0.500	32.2	10.00	57.00	139.62	104.67	0.15
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

64.4

## WALL PORTION: PIER (13-19)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 13	0.143	35.3	10.00	57.00	139.62	114.70	0.16
PIER 14	0.143	35.3	10.00	57.00	139.62	114.70	0.16
PIER 15	0.143	35.3	10.00	57.00	139.62	114.70	0.16
PIER 16	0.143	35.3	10.00	57.00	139.62	114.70	0.16
PIER 17	0.143	35.3	10.00	57.00	139.62	114.70	0.16
PIER 18	0.143	35.3	10.00	57.00	139.62	114.70	0.16
PIER 19	0.143	35.3	10.00	57.00	139.62	114.70	0.16
	0.000	0.0		0.00	0.00	0.00	0.00

247.1

## WALL PORTION: PIER (22-23)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 22	0.500	32.2	10.00	57.00	139.62	104.67	0.15
PIER 23	0.500	32.2	10.00	57.00	139.62	104.67	0.15
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

64.4

## WALL PORTION: PIER (25-26)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 25	0.500	32.2	10.00	57.00	139.62	104.67	0.15
PIER 26	0.500	32.2	10.00	57.00	139.62	104.67	0.15
	0.000	0.0		0.00	0.00	0.00	0.00
	0.000	0.0		0.00	0.00	0.00	0.00

64.4

WALL PORTION: PIER (28-30)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 28	0.333	34.1	10.00	57.00	139.62	110.83	0.16
PIER 29	0.333	34.1	10.00	57.00	139.62	110.83	0.16
PIER 30	0.333	34.1	10.00	57.00	139.62	110.83	0.16
	1.000	102.3					

WALL PORTION: PIER (31-33)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 31	0.333	34.1	10.00	57.00	139.62	110.83	0.16
PIER 32	0.333	34.1	10.00	57.00	139.62	110.83	0.16
PIER 33	0.333	34.1	10.00	57.00	139.62	110.83	0.16
	1.000	102.3					

WALL PORTION: WALL AT OFFICES

TOTAL WALL SHEAR =

63.2 KIPS

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER C1	0.161	10.2	10.00	35.04	85.83	33.00	0.08
PIER C2	0.679	42.9	10.00	81.00	198.41	139.39	0.14
PIER C3	0.161	10.2	10.00	35.04	85.83	33.00	0.08
	1.000	63.2					

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 05/16/03  
TIME: 07:47 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR BACK WALL (ONE SIDE OF BREEZEWAY)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	172.17	0.073	213233	0	213233	NA
SOLID STRIP	FIXED	14.00	4.50	172.17	0.026	597096	0	597096	NA
PIER 1	FIXED	14.00	4.50	4.17	1.079	10216	0	10216	0.044
PIER 2	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 3	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 4	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 5	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 6	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 7	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 8	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 9	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 10	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 11	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 12	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 13	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 14	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 15	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 16	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 17	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.058
PIER 18	FIXED	14.00	4.50	3.00	1.500	5770	0	5770	0.025
					0.000	0			0.000
					0.000	0			0.000

Lremain = 87.17 TOTAL (PIERS ONLY) = 231232 1.000  
THKred = 11.53 WALL RIGIDITY = 136247 (K/IN)

B 051

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.95	12.58	172.17	0.073	136241	0	136241	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			136241	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 05/16/03  
TIME: 08:23 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2075 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: GROUND FLOOR BACK WALL (ONE SIDE OF BREEZEWAY)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	2075.00	14.00	2060.04	7064.47	26103.5	1.01
PIER 1	0.044	91.7	14.00	47.04	161.31	412.6	0.71
PIER 2	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 3	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 4	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 5	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 6	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 7	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 8	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 9	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 10	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 11	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 12	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 13	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 14	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 15	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 16	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 17	0.058	120.7	14.00	57.00	195.47	543.2	0.77
PIER 18	0.025	51.8	14.00	33.00	113.17	233.0	0.57
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

2075.0

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 01/30/03  
TIME: 11:29 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	363.33	0.035	450651	0	450651	NA
SOLID STRIP	FIXED	14.00	6.50	363.33	0.018	872456	0	872456	NA
PIER 1	FIXED	14.00	6.50	4.17	1.559	5362	0	5362	0.020
PIER 2	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 3	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 4	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 5	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 6	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 7	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 8	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 9	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 10	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 11	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 12	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 13	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 14	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 15	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 16	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 17	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 18	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 19	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 20	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 21	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 22	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 23	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 24	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 25	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 26	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 27	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 28	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 29	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 30	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 31	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 32	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 33	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 34	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 35	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 36	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.027
PIER 37	FIXED	14.00	6.50	4.17	1.559	5362	0	5362	0.020
					0.000	0			0.000
					0.000	0			0.000

L<sub>remain</sub> = 183.34 TOTAL (PIERS ONLY) = 272808 1.000  
THK<sub>red</sub> = 10.42 WALL RIGIDITY = 211042 (K/IN)

## WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	6.56	12.58	363.33	0.035	211162	0	211162	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			211162	(K/IN)



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 02/04/03  
TIME: 10:12 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 3236 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 2ND FLOOR BACK WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	3236.00	14.00	4353.96	14930.97	40708.9	0.75
PIER 1	0.020	63.6	14.00	47.04	161.31	206.7	0.35
PIER 2	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 3	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 4	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 5	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 6	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 7	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 8	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 9	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 10	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 11	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 12	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 13	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 14	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 15	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 16	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 17	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 18	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 19	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 20	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 21	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 22	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 23	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 24	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 25	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 26	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 27	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 28	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 29	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 30	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 31	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 32	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 33	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 34	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 35	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 36	0.027	88.8	14.00	57.00	195.47	288.7	0.41
PIER 37	0.020	63.6	14.00	47.04	161.31	206.7	0.35
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

3236.0

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 01/30/03  
TIME: 11:32 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH,  $F_c$  OR  $F_m$  = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	12.00	12.58	363.33	0.035	385777	0	385777	NA
SOLID STRIP	FIXED	12.00	6.50	363.33	0.018	747820	0	747820	NA
PIER 1	FIXED	12.00	6.50	4.17	1.559	4596	0	4596	0.020
PIER 2	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 3	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 4	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 5	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 6	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 7	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 8	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 9	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 10	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 11	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 12	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 13	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 14	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 15	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 16	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 17	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 18	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 19	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 20	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 21	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 22	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 23	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 24	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 25	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 26	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 27	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 28	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 29	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 30	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 31	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 32	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 33	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 34	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 35	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 36	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.027
PIER 37	FIXED	12.00	6.50	4.17	1.559	4596	0	4596	0.020
					0.000	0			0.000
					0.000	0			0.000

Lremain = 183.34 TOTAL (PIERS ONLY) = 233836 1.000  
THKred = 8.93 WALL RIGIDITY = 180784 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	5.63	12.58	363.33	0.035	180994	0	180994	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			180994	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 02/04/03  
TIME: 10:57 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI  
SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1486 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 3RD FLOOR BACK WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1486.00	12.00	4353.96	12797.98	18693.9	0.34
PIER 1	0.020	29.2	12.00	47.04	138.27	94.9	0.16
PIER 2	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 3	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 4	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 5	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 6	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 7	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 8	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 9	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 10	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 11	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 12	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 13	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 14	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 15	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 16	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 17	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 18	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 19	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 20	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 21	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 22	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 23	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 24	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 25	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 26	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 27	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 28	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 29	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 30	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 31	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 32	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 33	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 34	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 35	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 36	0.027	40.8	12.00	57.00	167.55	132.6	0.19
PIER 37	0.020	29.2	12.00	47.04	138.27	94.9	0.16
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

1486.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 01/30/03  
TIME: 11:08 AM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR SIDE WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	16.00	12.58	60.83	0.207	84967	0	84967	NA
SOLID STRIP	FIXED	16.00	4.50	60.83	0.074	240688	0	240688	NA
PIER 1	FIXED	16.00	4.50	6.50	0.692	22003	0	22003	0.152
PIER 2	FIXED	16.00	4.50	11.00	0.409	41150	0	41150	0.284
PIER 3	FIXED	16.00	4.50	11.00	0.409	41150	0	41150	0.284
PIER 4	FIXED	16.00	4.50	9.00	0.500	32756	0	32756	0.226
PIER 5	FIXED	16.00	4.50	3.33	1.351	7990	0	7990	0.055
TOTAL (PIERS ONLY) = WALL RIGIDITY =								145048 68924	1.000 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.98	12.58	60.83	0.207	68930	0	68930	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			68930	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 355

DATE: 05/16/03  
 TIME: 07:51 AM

CONCRETE OR MASONRY [C/M] = C  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1830 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: GROUND FLOOR SIDE WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1830.00	16.00	723.96	2837.33	23021.4	2.55
PIER 1	0.152	277.6	16.00	75.00	293.94	624.6	0.67
PIER 2	0.284	519.2	16.00	129.00	505.57	1168.1	0.73
PIER 3	0.284	519.2	16.00	129.00	505.57	1168.1	0.73
PIER 4	0.226	413.3	16.00	105.00	411.51	929.8	0.71
PIER 5	0.055	100.8	16.00	36.96	144.85	226.8	0.50

1830.0



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 355

DATE: 02/04/03  
 TIME: 10:18 AM

CONCRETE OR MASONRY [C/M] = C  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1696 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 2ND FLOOR SIDE WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1696.00	14.00	723.96	2482.67	21335.7	2.36
PIER 1	0.144	243.6	14.00	75.00	257.20	791.7	0.85
PIER 2	0.293	497.4	14.00	129.00	442.38	1616.6	1.01
PIER 3	0.293	497.4	14.00	129.00	442.38	1616.6	1.01
PIER 4	0.228	385.8	14.00	105.00	360.07	1254.0	0.96
PIER 5	0.042	71.7	14.00	36.96	126.75	233.2	0.51

1696.0





## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 355

DATE: 02/04/03  
 TIME: 11:03 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI  
 SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 62.8 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 3RD FLOOR SIDE WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	62.80	12.00	723.96	2128.00	790.0	0.09
PIER 1	0.144	9.0	12.00	75.00	220.45	29.3	0.03
PIER 2	0.293	18.4	12.00	129.00	379.18	59.9	0.04
PIER 3	0.293	18.4	12.00	129.00	379.18	59.9	0.04
PIER 4	0.228	14.3	12.00	105.00	308.64	46.4	0.04
PIER 5	0.042	2.7	12.00	36.96	108.64	8.6	0.02

62.8

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 01/30/03  
TIME: 11:16 AM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	12.58	50.00	0.252	34670	0	34670	NA
SOLID STRIP	FIXED	8.00	7.00	50.00	0.140	63272	0	63272	NA
PIER 1	FIXED	8.00	7.00	36.33	0.193	45689	0	45689	0.882
PIER 2	FIXED	8.00	7.00	6.67	1.049	6100	0	6100	0.118
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			51789	1.000
					WALL RIGIDITY =			30914	(K/IN)

## WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	7.13	12.58	50.00	0.252	30899	0	30899	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			30899	(K/IN)

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 05/16/03  
TIME: 08:18 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI  
SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 746 KIPS

WALL PORTION:	GROUND FLOOR HALLWAY WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	746.00	8.00	594.00	1164.00	9384.7	1.27
PIER 1	0.882	658.1	8.00	432.96	848.42	4606.9	0.85
PIER 2	0.118	87.9	8.00	77.04	150.97	615.1	0.65
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

746.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 01/30/03  
TIME: 11:15 AM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR HALLWAY WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	12.58	50.00	0.252	34670	0	34670	NA
SOLID STRIP	FIXED	8.00	7.00	50.00	0.140	63272	0	63272	NA
PIER 1	FIXED	8.00	7.00	33.50	0.209	42033	0	42033	0.746
PIER 2	FIXED	8.00	7.00	12.50	0.560	14324	0	14324	0.254
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			56358	1.000
					WALL RIGIDITY =			32486	(K/IN)

## WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	7.50	12.58	50.00	0.252	32503	0	32503	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			32503	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 355

DATE: 02/04/03  
 TIME: 10:26 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI  
 SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 975 KIPS

WALL PORTION: 2ND FLOOR HALLWAY WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	975.00	8.00	594.00	1164.00	12265.5	1.66
PIER 1	0.746	727.2	8.00	399.00	781.88	5090.3	1.02
PIER 2	0.254	247.8	8.00	147.00	288.06	1734.7	0.95
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

975.0



### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 01/30/03  
TIME: 11:18 AM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F'c OR F'm =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR HALLWAY WALL

[illegible]



### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 02/04/03  
TIME: 09:54 AM

CONCRETE OR MASONRY [C/M] =  
MATERIAL STRENGTH,  $F'_c$  OR  $F'_m$  =

C  
3000 PSI

MODULUS OF ELASTICITY =  
SHEAR MODULUS =

3122 KSI  
1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY2 WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	12.58	50.00	0.252	34670	0	34670	NA
SOLID STRIP	FIXED	8.00	4.50	50.00	0.090	98826	0	98826	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =		0		0.000
					WALL RIGIDITY =		ERROR!		(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 355

DATE: 05/16/03  
 TIME: 08:17 AM

CONCRETE OR MASONRY [C/M] = C  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 828 KIPS

WALL PORTION: GROUND FLOOR HALLWAY2 WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	828.00	8.00	594.00	1164.00	10416.2	1.41
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

0.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 02/04/03  
TIME: 10:38 AM

CONCRETE OR MASONRY [C/M] =  
MATERIAL STRENGTH,  $F'_c$  OR  $F'_m$  =

C  
3000 PSI

MODULUS OF ELASTICITY =  
SHEAR MODULUS =

3122 KSI  
1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR HALLWAY3 WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	12.58	50.00	0.252	34670	0	34670	NA
SOLID STRIP	FIXED	8.00	6.50	50.00	0.130	68204	0	68204	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
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					0.000	0	0	0	0.000
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					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
			</						

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 355

DATE: 02/04/03  
 TIME: 10:38 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25,  $F_y$  75000 PSI  
 MATERIAL STRENGTH\*1.25,  $F'_c$  OR  $F'_m$  = 3750 PSI  
 SHEAR DEMAND MODIFIER,  $m = 2$   
 FLEXURE DEMAND MODIFIER,  $m = 2$

TOTAL WALL SHEAR = 1032 KIPS

WALL PORTION:	2ND FLOOR HALLWAY3 WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1032.00	8.00	594.00	1164.00	12982.6	1.76
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

0.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 02/04/03  
TIME: 09:47 AM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR BREEZEWAY WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	16.00	12.58	50.00	0.252	69339	0	69339	NA
SOLID STRIP	FIXED	16.00	4.50	50.00	0.090	197652	0	197652	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			ERROR!	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 355

DATE: 05/16/03  
 TIME: 08:16 AM

CONCRETE OR MASONRY [C/M] = C  
 MATERIAL STRENGTH\*1.25,  $F'_c$  OR  $F'_m$  = 3750 PSI

REINFORCING STRENGTH\*1.25,  $F_y$  75000 PSI  
 SHEAR DEMAND MODIFIER,  $m = 2$   
 FLEXURE DEMAND MODIFIER,  $m = 2$

TOTAL WALL SHEAR = 1528 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: GROUND FLOOR BREEZEWAY WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1528.00	16.00	594.00	2328.00	19222.2	2.60
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

0.0



### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 355

DATE: 02/04/03  
TIME: 10:33 AM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F'c OR F'm =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR BREEZEWAY WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.00	12.58	50.00	0.252	34670	0	34670	NA
SOLID STRIP	FIXED	8.00	6.50	50.00	0.130	68204	0	68204	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =		0	0.000	
					WALL RIGIDITY =		ERROR!		(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 355

DATE: 02/04/03  
 TIME: 10:33 AM

CONCRETE OR MASONRY [C/M] = C  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 960 KIPS

WALL PORTION: 2ND FLOOR BREEZEWAY WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	960.00	8.00	594.00	1164.00	12076.8	1.63

0.000	0.0	0.00	0.00	0.00	0.00	0.0	0.00
0.000	0.0	0.00	0.00	0.00	0.00	0.0	0.00
0.000	0.0	0.00	0.00	0.00	0.00	0.0	0.00
0.000	0.0	0.00	0.00	0.00	0.00	0.0	0.00
0.000	0.0	0.00	0.00	0.00	0.00	0.0	0.00
0.000	0.0						
0.000	0.0						
0.000	0.0						
0.000	0.0						
0.000	0.0						
0.000	0.0						

0.0







PROJ: QUAD C, BUILDING 356  
TITLE: w/ SHEAR WALL RETROFIT

DATE: 19-May 2003  
TIME: 02:09 PM P.M.

$$V = C1 \cdot C2 \cdot C3 \cdot S_a \cdot W$$

$$T = C_t \cdot (h_n)^{3/4}$$

$$S_{xs} = 2/3 \cdot F_a \cdot S_s$$

$$S_{x1} = 2/3 \cdot F_v \cdot S_1$$

$$T_0 = (S_{x1} \cdot B_s / S_{xs} \cdot B_1)$$

SHORT PERIOD SPECTRAL RESPONSE ACCELERATION PARAMETER,  $S_s = 0.60$   
SPECTRAL RESPONSE ACCELERATION PARAMETER AT 1 SEC,  $S_1 = 0.17$

PERFORMANCE LEVEL [IO, SE, LS, CP] =	IO	$B_s =$	1.00
SOIL CLASS [A, B, C, D, E, F] =	E	$B_1 =$	1.00
% DAMPING =	5.000	$T_0 =$	0.62
SITE COEFFICIENT, $F_a =$	1.5	$C_1 =$	1.28
SITE COEFFICIENT, $F_v =$	3.3	$C_2 =$	1.00
$C_t$ FACTOR [0.035, 0.030, 0.020, 0.060] =	0.020	$C_3 =$	1.00

DESIGN SHORT PERIOD RESPONSE ACCELERATION PARAMETER,  $S_{xs} = 0.60$   
DESIGN RESPONSE ACCELERATION PARAMETER AT 1 SEC,  $S_{x1} = 0.37$

RESPONSE SPECTRAL ACCELERATION (AT PERIOD T),  $S_a = 0.60$

TOTAL BUILDING HEIGHT = 41.66 FT  
BUILDING SEISMIC WEIGHT, W = 9841 KIPS

	T (SEC)	k	BASE V (KIPS)
LINEAR STATIC METHOD	0.33	1.00	7566.25

BASE SHEAR COEFFICIENT = 0.7688 x W  
TOTAL DESIGN BASE SHEAR = 7566.2 KIPS

$C_t$	LATERAL SYSTEM	%damping	$B_s$	$B_1$
0.035	Steel Moment Resisting Frames	2.00	0.80	0.80
0.030	RC Moment Resisting Frames	5.00	1.00	1.00
0.030	Eccentrically Braced Frames	10.00	1.20	1.20
0.020	All Other Buildings			
0.060	Wood Buildings			

PROJ: QUAD C, BUILDING 356  
TITLE: w/ SHEAR WALL RETROFIT

DATE: 19-May 2003  
TIME: 02:09 PM P.M.

CLASS SITE DESCRIPTION - SOIL PROFILES

A HARD ROCK, SHEAR WAVE VELOCITY  $V_s > 5000$  FT/S.  
B ROCK, SHEAR WAVE VELOCITY  $V_s$  FROM 2500 TO 5000 FT/S.  
C VERY DENSE SOIL AND SOFT ROCK, SHEAR WAVE VELOCITY  
 $V_s$  FROM 1200 TO 2500 FT/S.  
D STIFF SOIL, SHEAR WAVE VELOCITY  $V_s$  FROM 600 TO 1200 FT/S.  
E SOFT SOIL, SHEAR WAVE VELOCITY  $V_s < 600$  FT/S.  
(ASSUME CLASS E IF NO INFORMATION IS AVAILABLE.)  
F SOIL REQUIRING SITE-SPECIFIC EVALUATION.

SITE COEFFICIENT,  $F_a$  (Based on Site Class & Spectral Response Acceleration  $S_s$ )

CLASS	SPECTRAL RESPONSE ACCELERATION, $S_s$				
	0.25	0.50	0.75	1.00	1.25
A	0.80	0.80	0.80	0.80	0.80
B	1.00	1.00	1.00	1.00	1.00
C	1.20	1.20	1.10	1.00	1.00
D	1.60	1.40	1.20	1.10	1.00
E	2.50	1.70	1.20	0.90	NA
F	NA	NA	NA	NA	NA

SITE COEFFICIENT,  $F_v$  (Based on Site Class & Spectral Response Acceleration  $S_1$ )

CLASS	SPECTRAL RESPONSE ACCELERATION, $S_1$				
	0.10	0.20	0.30	0.40	0.50
A	0.80	0.80	0.80	0.80	0.80
B	1.00	1.00	1.00	1.00	1.00
C	1.70	1.60	1.50	1.40	1.30
D	2.40	2.00	1.80	1.60	1.50
E	3.50	3.20	2.80	2.40	NA
F	NA	NA	NA	NA	NA

PROJ: QUAD C, BUILDING 356  
 TITLE: w/ SHEAR WALL RETROFIT

DATE: 19-May 2003  
 TIME: 02:09 PM P.M.

## INCH-POUND UNITS:

LEVEL	WEIGHT (klps)	DH (ft)	HEIGHT (ft)	W*H/1000 (ft-k)	FORCE (klps)	SHEAR (klps)	V*DH (ft-k)	MOMENT (ft-k)
	0		0.0	0	0.0			0
		0.0				0.0	0	
	0		0.0	0	0.0			0
		0.0				0.0	0	
ROOF	1875		41.7	78	2607.0			0
		16.5				2607.0	43015	
3RD	3846		25.2	97	3229.5			43015
		12.6				5836.5	73423	
2ND	4120		12.6	52	1729.8			116438
		12.6				7566.2	95183	
GRND				0	0.0			211621
	9841	41.7		227	7566.2		211621	



## SEISMIC WEIGHT DETERMINATION

PAGE 1

PROJECT: QUAD C, BUILDING 356 (w/ retrofit) DATE: 02/03/03  
 TITLE: ROOF TIME: 11:36 AM

FLOORS: (ROOF)	DESCRIPTION	WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (kips)
	ROOF	0.018	25054	438.45
		0.000	0	0.00
		0.000	0	0.00
		0.000	0	0.00

438.45

BEAMS: (ROOF)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	6.50	70.00	0.474	364.00	1.00	172.52
GRID B	8.00	10.00	0.083	364.00	1.00	30.33
GRID C	10.00	10.00	0.104	364.00	1.00	37.92
GRID D	10.00	10.00	0.104	364.00	1.00	37.92
GRID E	6.50	70.00	0.474	364.00	1.00	172.52
TRANS	10.00	10.00	0.104	60.83	19.00	120.39
TRANS-C to D	12.50	12.50	0.163	60.83	19.00	188.11
GRID 1, 21	6.50	70.00	0.474	50.00	2.00	47.40

807.11

COLUMNS: (ROOF)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	10.00	48.00	0.500	5.58	8.00	22.32
GRID C	16.00	16.00	0.267	5.58	19.00	28.27
GRID D	16.00	16.00	0.267	5.58	19.00	28.27
GRID E	4.00	10.00	0.042	5.58	19.00	4.42
GRID B	4.00	10.00	0.042	5.58	19.00	4.42
	0.00	0.00	0.000	0.00	0.00	0.00

87.70

WALLS: (ROOF)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (kips)
GRID B	7.82	150.00	0.098	364.00	5.58	198.54
GRID E	9.27	150.00	0.116	364.00	5.58	235.36
GRID A	10.00	150.00	0.125	34.83	5.58	24.29
GRID 1	12.00	150.00	0.150	50.00	5.58	41.85
GRID 21	12.00	150.00	0.150	50.00	5.58	41.85
GRID	0.00	150.00	0.000	50.00	5.58	0.00
GRID	0.00	150.00	0.000	50.00	5.58	0.00
GRID	0.00	150.00	0.000	50.00	5.58	0.00
GRID	0.00	150.00	0.000	0.00	5.58	0.00

541.89

FLOORS	438.45 kips
BEAMS	807.11 kips
COLUMNS	87.70 kips
WALLS	541.89 kips

1875.15 kips

## SEISMIC WEIGHT DETERMINATION

PAGE 2

PROJECT:	QUAD C, BUILDING 356 (w/ retrofit)				DATE:	05/19/03
TITLE:	3RD FL				TIME:	02:05 PM
FLOORS: (3RD FL)	DESCRIPTION		WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (kips)	
	TYPICAL FLOOR		0.101	18200	1838.20	
	BALCONY		0.078	3942	307.49	
	STAIRS (add to balcony)		0.092	253	23.26	
	STAIRS (add to balcony)		0.092	217	19.93	
					2188.87	
BEAMS: (3RD FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	6.00	27.00	0.169	364.00	1.00	61.43
GRID C	12.00	14.00	0.175	364.00	1.00	63.70
GRID D	12.00	14.00	0.175	364.00	1.00	63.70
	0.00	0.00	0.000	0.00	0.00	0.00
	0.00	0.00	0.000	0.00	0.00	0.00
						188.83
COLUMNS: (3RD FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	10.00	48.00	0.500	5.58	8.00	22.32
GRID C	16.00	16.00	0.267	5.58	19.00	28.27
GRID D	16.00	16.00	0.267	5.58	19.00	28.27
GRID E	4.00	10.00	0.042	5.58	19.00	4.42
GRID B	4.00	10.00	0.042	5.58	19.00	4.42
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	10.00	0.042	6.04	19.00	4.78
GRID B	4.00	10.00	0.042	6.04	19.00	4.78
						149.06
WALLS: (3RD FL)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (kips)
GRID B	7.82	150.00	0.098	364.00	5.58	198.54
GRID E	9.27	150.00	0.116	364.00	5.58	235.36
GRID A	10.00	150.00	0.125	34.83	5.58	24.29
GRID 1	12.00	150.00	0.150	50.00	5.58	41.85
GRID 21	12.00	150.00	0.150	50.00	5.58	41.85
	0.00	150.00	0.000	0.00	0.00	0.00
GRID B	9.38	150.00	0.117	364.00	6.04	257.78
GRID E	10.82	150.00	0.135	364.00	6.04	297.36
GRID A	10.00	150.00	0.125	34.83	6.04	26.30
GRID 1	14.00	150.00	0.175	50.00	6.04	52.85
GRID 21	14.00	150.00	0.175	50.00	6.04	52.85
GRID 6	8.00	150.00	0.100	50.00	6.04	30.20
GRID 11	8.00	150.00	0.100	50.00	6.04	30.20
GRID 16	8.00	150.00	0.100	50.00	6.04	30.20
	8.00	150.00	0.100	0.00	0.00	0.00
	8.00	150.00	0.100	0.00	0.00	0.00
						1319.62
FLOORS	2188.87 kips					
BEAMS	188.83 kips					
COLUMNS	149.06 kips					
WALLS	1319.62 kips					
	3846.38 kips					

## SEISMIC WEIGHT DETERMINATION

PAGE 3

PROJECT: QUAD C, BUILDING 356 (w/ retrofit) DATE: 05/19/03  
 TITLE: 2ND FL TIME: 02:05 PM

FLOORS: (2ND FL)	DESCRIPTION	WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (kips)
	TYPICAL FLOOR	0.101	18200	1838.20
	BALCONY	0.078	3942	307.49
	STAIRS (add to balcony)	0.092	253	23.26
	STAIRS (add to balcony)	0.092	217	19.93

2188.87

BEAMS: (2ND FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	6.00	27.00	0.169	364.00	1.00	61.43
GRID C	12.00	14.00	0.175	364.00	1.00	83.70
GRID D	12.00	14.00	0.175	364.00	1.00	63.70
	0.00	0.00	0.000	0.00	0.00	0.00
	0.00	0.00	0.000	0.00	0.00	0.00

188.83

COLUMNS: (2ND FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	10.00	0.042	6.04	19.00	4.78
GRID B	4.00	10.00	0.042	6.04	19.00	4.78
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	10.00	0.042	6.04	19.00	4.78
GRID B	4.00	10.00	0.042	6.04	19.00	4.78
	0.00	0.00	0.000	0.00	0.00	0.00

122.73

WALLS: (2ND FL)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (kips)
GRID B	9.38	150.00	0.117	364.00	6.04	257.78
GRID E	10.82	150.00	0.135	364.00	6.04	297.36
GRID A	10.00	150.00	0.125	34.83	6.04	26.30
GRID 1	14.00	150.00	0.175	50.00	6.04	52.85
GRID 21	14.00	150.00	0.175	50.00	6.04	52.85
GRID 6	8.00	150.00	0.100	50.00	6.04	30.20
GRID 11	8.00	150.00	0.100	50.00	6.04	30.20
GRID 16	8.00	150.00	0.100	50.00	6.04	30.20
	0.00	150.00	0.000	0.00	0.00	0.00
GRID B	10.19	150.00	0.127	364.00	6.04	280.04
GRID E	11.80	150.00	0.148	364.00	6.04	324.29
GRID A	10.00	150.00	0.125	34.83	6.04	26.30
GRID 1	16.00	150.00	0.200	50.00	6.04	60.40
GRID 21	16.00	150.00	0.200	50.00	6.04	60.40
GRID 6	8.00	150.00	0.100	50.00	6.04	30.20
GRID 11	8.00	150.00	0.100	50.00	6.04	30.20
GRID 16	8.00	150.00	0.100	50.00	6.04	30.20
	0.00	150.00	0.000	0.00	0.00	0.00
	0.00	150.00	0.000	0.00	0.00	0.00

1619.76

FLOORS	2188.87 kips
BEAMS	188.83 kips
COLUMNS	122.73 kips
WALLS	1619.76 kips

4120.18 kips

## CENTER OF MASS DETERMINATION

PAGE 1

PROJECT: QUAD C. BUILDING 356 (w/ retrofit)  
 TITLE: ROOF

DATE: 02/03/03  
 TIME: 11:36 AM

FLOORS: (ROOF)	DESCRIPTION	WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
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	ROOF	438.45	182.00	30.42	79797	13335
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

79797 13335

BEAMS: (ROOF)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
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	GRID A	172.52	182.00	60.42	31399	10424
	GRID B	30.33	182.00	49.58	5521	1504
	GRID C	37.92	182.00	33.17	6901	1258
	GRID D	37.92	182.00	16.83	6901	638
	GRID E	172.52	182.00	0.42	31399	72
	TRANS	120.39	182.00	30.42	21911	3662
	TRANS-C to D	188.11	182.00	25.00	34237	4703
	GRID 1, 21	47.40	182.00	30.42	8626	1442

146894 23703

COLUMNS: (ROOF)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
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	GRID A	22.32	182.00	60.42	4062	1349
	GRID C	28.27	182.00	33.17	5146	938
	GRID D	28.27	182.00	16.83	5146	476
	GRID E	4.42	182.00	0.67	804	3
	GRID B	4.42	182.00	49.33	804	218
		0.00	0.00	0.00	0	0

15961 2983

WALLS: (ROOF)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
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	GRID B	198.54	182.00	49.67	36135	9862
	GRID E	235.38	182.00	0.33	42835	78
	GRID A	24.29	182.00	60.50	4421	1470
	GRID 1	41.85	182.00	25.00	7617	1046
	GRID 21	41.85	182.00	25.00	7617	1046
	GRID	0.00	182.00	25.00	0	0
	GRID	0.00	182.00	25.00	0	0
	GRID	0.00	182.00	25.00	0	0
		0.00	0.00	0.00	0	0

WEIGHTX WEIGHTY 98624 13502

FLOORS	79797	13335		
BEAMS	146894	23703	CENTER OF MASS X =	182.00
COLUMNS	15961	2983	CENTER OF MASS Y =	28.54
WALLS	98624	13502		

341277.03 53522.84

## CENTER OF MASS DETERMINATION

PAGE 2

PROJECT: QUAD C, BUILDING 356 (w/ retrofit)  
 TITLE: 3RD FL

DATE: 05/19/03  
 TIME: 02:05 PM

FLOORS: (3RD FL) DESCRIPTION WEIGHT (klps) X (ft) Y (ft) WEIGHTX (k-ft) WEIGHTY (k-ft)

TYPICAL FLOOR	1838.20	182.00	25.00	334552	45955
BALCONY	307.49	182.00	55.42	55962	17039
STAIRS (add to balcony)	23.26	182.00	55.42	4232	1289
STAIRS (add to balcony)	19.93	131.67	58.12	2624	1158

397371 65441

BEAMS: (3RD FL) WEIGHT (klps) X (ft) Y (ft) WEIGHTX (k-ft) WEIGHTY (k-ft)

GRID A	61.43	182.00	60.42	11179	3711
GRID C	63.70	182.00	33.17	11593	2113
GRID D	63.70	182.00	16.83	11593	1072
	0.00	0.00	0.00	0	0
	0.00	0.00	0.00	0	0

34366 6896

COLUMNS: (3RD FL) WEIGHT (klps) X (ft) Y (ft) WEIGHTX (k-ft) WEIGHTY (k-ft)

GRID A	22.32	182.00	60.42	4062	1349
GRID C	28.27	182.00	33.17	5146	938
GRID D	28.27	182.00	16.83	5146	476
GRID E	4.42	182.00	0.67	804	3
GRID B	4.42	182.00	49.33	804	218
GRID A	20.68	182.00	60.42	3764	1249
GRID C	15.56	182.00	33.17	2832	516
GRID D	15.56	182.00	16.83	2832	282
GRID E	4.78	182.00	0.67	870	3
GRID B	4.78	182.00	49.33	870	236

27130 5250

WALLS: (3RD FL) WEIGHT (klps) X (ft) Y (ft) WEIGHTX (k-ft) WEIGHTY (k-ft)

GRID B	198.54	182.00	49.67	36135	9862
GRID E	235.36	182.00	0.33	42835	78
GRID A	24.29	182.00	60.50	4421	1470
GRID 1	41.85	182.00	25.00	7617	1046
GRID 21	41.85	182.00	25.00	7617	1046
	0.00	0.00	0.00	0	0
GRID B	257.78	182.00	49.67	46916	12804
GRID E	287.36	182.00	0.33	54119	98
GRID A	26.30	182.00	60.50	4786	1591
GRID 1	52.85	182.00	25.00	9619	1321
GRID 21	52.85	182.00	25.00	9619	1321
GRID 6	30.20	182.00	25.00	5496	755
GRID 11	30.20	182.00	25.00	5496	755
GRID 16	30.20	182.00	25.00	5496	755
	0.00	0.00	0.00	0	0
	0.00	0.00	0.00	0	0

WEIGHTX WEIGHTY

240172 32902

FLOORS	397371	65441
BEAMS	34366	6896
COLUMNS	27130	5250
WALLS	240172	32902

CENTER OF MASS X = 181.74  
 CENTER OF MASS Y = 28.73  
 Total center of mass X = 181.82  
 Total center of mass Y = 28.67

699038.57 110489.26

3092

CENTER OF MASS DETERMINATION

PAGE 3

PROJECT: QUAD C, BUILDING 356 (w/ retrofit)  
TITLE: 2ND FL

DATE: 05/19/03  
TIME: 02:05 PM

FLOORS: (2ND FL)	DESCRIPTION	WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
---------------------	-------------	------------------	-----------	-----------	-------------------	-------------------

	TYPICAL FLOOR	1838.20	182.00	25.00	334552	45955
	BALCONY	307.49	182.00	55.42	55962	17039
	STAIRS (add to balcony)	23.26	182.00	55.42	4232	1289
	STAIRS (add to balcony)	19.93	131.67	58.12	2624	1158

397371 65441

BEAMS: (2ND FL)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
--------------------	--	------------------	-----------	-----------	-------------------	-------------------

	GRID A	61.43	182.00	60.42	11179	3711
	GRID C	63.70	182.00	33.17	11593	2113
	GRID D	63.70	182.00	16.83	11593	1072
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

34366 6896

COLUMNS: (2ND FL)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
----------------------	--	------------------	-----------	-----------	-------------------	-------------------

	GRID A	20.68	182.00	60.42	3764	1249
	GRID C	15.56	182.00	33.17	2832	516
	GRID D	15.56	182.00	16.83	2832	262
	GRID E	4.78	182.00	0.67	870	3
	GRID B	4.78	182.00	49.33	870	236
	GRID A	20.68	182.00	60.42	3764	1249
	GRID C	15.56	182.00	33.17	2832	516
	GRID D	15.56	182.00	16.83	2832	262
	GRID E	4.78	182.00	0.67	870	3
	GRID B	4.78	182.00	49.33	870	236
		0.00	0.00	0.00	0	0

22337 4533

WALLS: (2ND FL)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
--------------------	--	------------------	-----------	-----------	-------------------	-------------------

	GRID B	257.78	182.00	49.67	46916	12804
	GRID E	297.38	182.00	0.33	54119	98
	GRID A	26.30	182.00	60.50	4786	1591
	GRID 1	52.85	182.00	25.00	9619	1321
	GRID 21	52.85	182.00	25.00	9619	1321
	GRID 6	30.20	182.00	25.00	5496	755
	GRID 11	30.20	182.00	25.00	5496	755
	GRID 16	30.20	182.00	25.00	5496	755
		0.00	0.00	0.00	0	0
	GRID B	280.04	182.00	49.67	50968	13910
	GRID E	324.29	182.00	0.33	59020	107
	GRID A	26.30	182.00	60.50	4786	1591
	GRID 1	60.40	182.00	25.00	10993	1510
	GRID 21	60.40	182.00	25.00	10993	1510
	GRID 6	30.20	182.00	25.00	5496	755
	GRID 11	30.20	182.00	25.00	5496	755
	GRID 16	30.20	182.00	25.00	5496	755
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

WEIGHTX WEIGHTY

294796 40293

FLOORS	397371	65441	CENTER OF MASS X =	181.76
BEAMS	34366	6896	CENTER OF MASS Y =	28.44
COLUMNS	22337	4533		
WALLS	294796	40293		

Total center of mass X = 181.80  
Total center of mass Y = 28.57

748870.22 117163.93

## Rigid Diaphragm Torsional Analysis

Description QUAD C, BUILDING 356 -- 2ND FLOOR DIAPHRAGM (REV)

## General Information

Y-Y Axis Shear	7,566.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	181.80 ft
X-X Axis Shear	7,566.00 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	28.06 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	8.230	363.330	12.580	182.000	50.000	0.0	Fix-Fix	1.0
2	9.950	363.330	12.580	182.000	0.000	0.0	Fix-Fix	1.0
3	14.390	50.000	12.580	0.000	25.000	90.0	Fix-Fix	1.0
4	14.390	50.000	12.580	363.330	25.000	90.0	Fix-Fix	1.0
5	12.930	50.000	12.580	90.750	25.000	90.0	Fix-Fix	1.0
6	13.280	50.000	12.580	181.920	25.000	90.0	Fix-Fix	1.0
7	12.930	50.000	12.580	272.580	25.000	90.0	Fix-Fix	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	8.441	3,388.362	85.689	3,474.051
2	8.441	4,096.500	-85.865	4,096.500
3	-18.087	1,572.510	286.891	1,859.402
4	18.246	1,572.510	289.244	1,861.755
5	-18.087	1,412.964	129.048	1,542.012
6	18.246	1,451.212	0.294	1,451.505
7	18.246	1,412.964	130.027	1,542.992

## Summary

X Distance to Center of Rigidity	181.720 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear	
Y Distance to Center of Rigidity	22.660 ft	Xcm + .05*Max-X - X-cr = 18.246 ft	Torsion = 138050.90 k-ft
		Xcm - .05*Max-X - X-cr = -18.087 ft	Torsion = -136844.57 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear	
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr = 8.441 ft	Torsion = 63,867.42 k-ft
		Ycm - .05*Max-Y - Y-cr = 2.358 ft	Torsion = 17,843.44 k-ft

## Rigid Diaphragm Torsional Analysis

Description QUAD C, BUILDING 356 -- 3RD FLOOR DIAPHRAGM (REV)

## General Information

Y-Y Axis Shear	5,837.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	181.83 ft
X-X Axis Shear	5,837.00 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	28.45 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	6.750	363.330	12.580	182.000	50.000	0.0	Fix-Fix	1.0
2	7.900	363.330	12.580	182.000	0.000	0.0	Fix-Fix	1.0
3	11.730	50.000	12.580	0.000	25.000	90.0	Fix-Fix	1.0
4	11.730	50.000	12.580	363.330	25.000	90.0	Fix-Fix	1.0
5	9.240	50.000	12.580	90.750	25.000	90.0	Fix-Fix	1.0
6	9.490	50.000	12.580	181.920	25.000	90.0	Fix-Fix	1.0
7	9.240	50.000	12.580	272.580	25.000	90.0	Fix-Fix	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	8.442	2,673.148	67.029	2,740.176
2	8.442	3,128.573	-67.093	3,128.573
3	-18.052	1,313.771	225.808	1,539.578
4	18.281	1,313.771	228.536	1,542.306
5	-18.052	1,034.888	89.043	1,123.931
6	18.281	1,062.889	0.208	1,063.096
7	18.281	1,034.888	90.068	1,124.956

## Summary

X Distance to Center of Rigidity	181.716 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear	
Y Distance to Center of Rigidity	23.049 ft	Xcm + .05*Max-X - X-cr = 18.281 ft	Torsion = 106704.20 k-ft
		Xcm - .05*Max-X - X-cr = -18.052 ft	Torsion = -105371.52 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear	
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr = 8.442 ft	Torsion = 49,276.51 k-ft
		Ycm - .05*Max-Y - Y-cr = 2.359 ft	Torsion = 13,770.04 k-ft



## Rigid Diaphragm Torsional Analysis

Description QUAD C, BUILDING 356 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

## General Information

Y-Y Axis Shear	0.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	182.00 ft
X-X Axis Shear	2,625.00 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	28.54 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	5.630	363.330	12.580	182.000	50.000	0.0	Fix-Pin	1.0
2	6.770	363.330	12.580	182.000	0.000	0.0	Fix-Pin	1.0
3	10.230	50.000	12.580	0.000	25.000	90.0	Fix-Pin	1.0
4	10.230	50.000	12.580	363.330	25.000	90.0	Fix-Pin	1.0
5	0.500	20.000	12.580	15.670	25.000	90.0	Fix-Pin	1.0
6	0.500	20.000	12.580	35.670	25.000	90.0	Fix-Pin	1.0
7	0.500	20.000	12.580	55.670	25.000	90.0	Fix-Pin	1.0
8	0.500	20.000	12.580	75.670	25.000	90.0	Fix-Pin	1.0
9	0.500	20.000	12.580	90.750	25.000	90.0	Fix-Pin	1.0
10	0.500	20.000	12.580	106.330	25.000	90.0	Fix-Pin	1.0
11	0.500	20.000	12.580	126.330	25.000	90.0	Fix-Pin	1.0
12	0.500	20.000	12.580	146.330	25.000	90.0	Fix-Pin	1.0
13	0.500	20.000	12.580	166.330	25.000	90.0	Fix-Pin	1.0
14	0.500	20.000	12.580	181.920	25.000	90.0	Fix-Pin	1.0
15	0.500	20.000	12.580	197.000	25.000	90.0	Fix-Pin	1.0
16	0.500	20.000	12.580	217.000	25.000	90.0	Fix-Pin	1.0
17	0.500	20.000	12.580	237.000	25.000	90.0	Fix-Pin	1.0
18	0.500	20.000	12.580	257.000	25.000	90.0	Fix-Pin	1.0
19	0.500	20.000	12.580	272.580	25.000	90.0	Fix-Pin	1.0
20	0.500	20.000	12.580	287.660	25.000	90.0	Fix-Pin	1.0
21	0.500	20.000	12.580	307.660	25.000	90.0	Fix-Pin	1.0
22	0.500	20.000	12.580	327.660	25.000	90.0	Fix-Pin	1.0
23	0.500	20.000	12.580	347.660	25.000	90.0	Fix-Pin	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	8.878	1,191.016	37.353	1,228.369
2	8.878	1,432.180	-37.358	1,432.180
3	8.878	0.902	55.931	56.833
4	8.878	0.902	55.929	56.831
5	8.878	0.000	0.696	0.696
6	8.878	0.000	0.612	0.612
7	8.878	0.000	0.528	0.528
8	8.878	0.000	0.444	0.444
9	8.878	0.000	0.381	0.381
10	8.878	0.000	0.316	0.316
11	8.878	0.000	0.232	0.232
12	8.878	0.000	0.148	0.148
13	8.878	0.000	0.064	0.064

Title : QUAD C

Job #

3096

Dsgnr:

Date:

Description : Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d

Scope : Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.

Rev: 506001

## Rigid Diaphragm Torsional Analysis

Page 2

## Description QUAD C, BUILDING 356 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

14	8.878	0.000	0.001	0.001
15	8.878	0.000	0.064	0.064
16	8.878	0.000	0.148	0.148
17	8.878	0.000	0.232	0.232
18	8.878	0.000	0.316	0.316
19	8.878	0.000	0.381	0.381
20	8.878	0.000	0.444	0.444
21	8.878	0.000	0.528	0.528
22	8.878	0.000	0.612	0.612
23	8.878	0.000	0.695	0.696

## Summary

X Distance to Center of Rigidity	181.668 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear		
Y Distance to Center of Rigidity	22.703 ft	Xcm + .05*Max-X - X-cr =	18.498 ft	Torsion = 0.00 k-ft
		Xcm - .05*Max-X - X-cr =	-17.835 ft	Torsion = 0.00 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear		
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr =	8.878 ft	Torsion = 23,305.56 k-ft
		Ycm - .05*Max-Y - Y-cr =	2.795 ft	Torsion = 7,337.68 k-ft

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 02/03/03  
TIME: 10:51 AM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI  
MODULUS OF ELASTICITY = 3122 KSI  
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: GROUND FLOOR FRONT WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	12.58	363.33	0.035	386272	0	386272	NA
SOLID STRIP	FIXED	12.00	10.00	363.33	0.028	486007	0	486007	NA
PIER (1-2)	FIXED				0.000	0	32046	32046	0.104
PIER (3-15)	FIXED				0.000	0	97119	97119	0.315
PIER 16	FIXED	12.00	10.00	35.67	0.280	46424	0	46424	0.151
PIER (17-29)					0.000	0	100599	100599	0.326
PIER (30-31)	FIXED				0.000	0	32046	32046	0.104
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

L<sub>remain</sub> = 210.01  
THK<sub>red</sub> = 10.19  
TOTAL (PIERS ONLY) = 308232  
WALL RIGIDITY = 264861  
(K/IN)

WALL PORTION: PIER (1-2)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	28.17	0.355	36068	0	36068	NA
SOLID STRIP	FIXED	12.00	4.50	28.17	0.160	83003	0	83003	NA
PIER 1	FIXED	12.00	4.50	18.17	0.248	52868	0	52868	0.821
PIER 2	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.179
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

L<sub>remain</sub> = 23.17  
TOTAL (PIERS ONLY) = 64399  
WALL RIGIDITY = 32046  
(K/IN)

WALL PORTION: PIER (3-15)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	123.67	0.081	165086	0	165086	NA
SOLID STRIP	FIXED	12.00	4.50	123.67	0.038	367541	0	367541	NA
PIER 3	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 4	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 5	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 6	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 7	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 8	FIXED	12.00	4.50	2.17	2.074	2544	0	2544	0.018
PIER 9	FIXED	12.00	4.50	5.83	0.772	14293	0	14293	0.099
PIER 10	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 11	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 12	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 13	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 14	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 15	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
					0.000	0	0	0	0.000

L<sub>remain</sub> = 63.00  
TOTAL (PIERS ONLY) = 143679  
WALL RIGIDITY = 97119  
(K/IN)

WALL PORTION: PIER (17-29)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	125.67	0.080	167768	0	167768	NA
SOLID STRIP	FIXED	12.00	4.50	125.67	0.036	373490	0	373490	NA
PIER 17	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 18	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 19	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 20	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 21	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 22	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 23	FIXED	12.00	4.50	7.83	0.575	20825	0	20825	0.139
PIER 24	FIXED	12.00	4.50	2.17	2.074	2544	0	2544	0.017
PIER 25	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 26	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 27	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 28	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 29	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077

Lremain = 65.00 TOTAL (PIERS ONLY) = 150210 1.000  
WALL RIGIDITY = 100599 (K/IN)

WALL PORTION: PIER (30-31)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	28.17	0.355	36068	0	36068	NA
SOLID STRIP	FIXED	12.00	4.50	28.17	0.160	83003	0	83003	NA
PIER 30	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.179
PIER 31	FIXED	12.00	4.50	18.17	0.248	52868	0	52868	0.821
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

Lremain = 23.17 TOTAL (PIERS ONLY) = 64399 1.000  
WALL RIGIDITY = 32046 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.23	12.58	363.33	0.035	264918	0	264918	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

TOTAL (PIERS ONLY) = 0 0.000  
WALL RIGIDITY = 264918 (K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 05/19/03  
TIME: 02:27 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 3474 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION:	GROUND FLOOR FRONT WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	3474.00	12.00	4353.96	12797.98	43702.9	0.80
PIER (1-2)	0.104	361.2	12.00	335.04	984.81	3611.8	0.86
PIER (3-15)	0.315	1094.6	12.00	1481.04	4353.35	10946.0	0.59
PIER 16	0.151	523.2	12.00	425.04	1249.36	5232.3	0.99
PIER (17-29)	0.326	1133.8	12.00	1505.04	4423.90	11338.2	0.60
PIER (30-31)	0.104	361.2	12.00	335.04	984.81	3611.8	0.86
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

3474.0

WALL PORTION:	PIER (1-2)						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 1	0.821	296.5	12.00	215.04	632.09	667.14	0.25
PIER 2	0.179	64.7	12.00	57.00	167.55	145.51	0.20
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

361.2

WALL PORTION:	PIER (3-15)						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 3	0.080	87.8	12.00	57.00	167.55	197.66	0.28
PIER 4	0.080	87.8	12.00	57.00	167.55	197.66	0.28
PIER 5	0.080	87.8	12.00	57.00	167.55	197.66	0.28
PIER 6	0.080	87.8	12.00	57.00	167.55	197.66	0.28
PIER 7	0.080	87.8	12.00	57.00	167.55	197.66	0.28
PIER 8	0.018	19.4	12.00	23.04	67.72	43.61	0.15
PIER 9	0.099	108.9	12.00	66.96	196.82	245.01	0.29
PIER 10	0.080	87.8	12.00	57.00	167.55	197.66	0.28
PIER 11	0.080	87.8	12.00	57.00	167.55	197.66	0.28
PIER 12	0.080	87.8	12.00	57.00	167.55	197.66	0.28
PIER 13	0.080	87.8	12.00	57.00	167.55	197.66	0.28
PIER 14	0.080	87.8	12.00	57.00	167.55	197.66	0.28
PIER 15	0.080	87.8	12.00	57.00	167.55	197.66	0.28
	0.000	0.0		0.00	0.00	0.00	0.00

1094.6

WALL PORTION: PIER (17-29)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 17	0.077	87.0	12.00	57.00	167.55	195.84	0.28
PIER 18	0.077	87.0	12.00	57.00	167.55	195.84	0.28
PIER 19	0.077	87.0	12.00	57.00	167.55	195.84	0.28
PIER 20	0.077	87.0	12.00	57.00	167.55	195.84	0.28
PIER 21	0.077	87.0	12.00	57.00	167.55	195.84	0.28
PIER 22	0.077	87.0	12.00	57.00	167.55	195.84	0.28
PIER 23	0.139	157.2	12.00	90.96	267.37	353.68	0.31
PIER 24	0.017	19.2	12.00	23.04	67.72	43.21	0.15
PIER 25	0.077	87.0	12.00	57.00	167.55	195.84	0.28
PIER 26	0.077	87.0	12.00	57.00	167.55	195.84	0.28
PIER 27	0.077	87.0	12.00	57.00	167.55	195.84	0.28
PIER 28	0.077	87.0	12.00	57.00	167.55	195.84	0.28
PIER 29	0.077	87.0	12.00	57.00	167.55	195.84	0.28
	1.000	1133.8					

WALL PORTION: PIER (30-31)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 30	0.179	64.7	12.00	57.00	167.55	145.51	0.20
PIER 31	0.821	296.5	12.00	215.04	632.09	667.14	0.25
	0.000	0.0		0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	1.000	361.2					

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 02/03/03  
TIME: 10:53 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: 2ND FLOOR FRONT WALL

[illegible]

WALL PORTION: PIER (1-2)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	28.17	0.355	36068	0	36068	NA
SOLID STRIP	FIXED	12.00	6.50	28.17	0.231	56905	0	56905	NA
PIER 1	FIXED	12.00	6.50	18.17	0.358	35768	0	35768	0.848
PIER 2	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.152
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
Lremain =				23.17	TOTAL (PIERS ONLY) =			42186	1.000
					WALL RIGIDITY =			29536	(K/IN)

WALL PORTION: PIER (3-15)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	123.67	0.081	165086	0	165086	NA
SOLID STRIP	FIXED	12.00	6.50	123.67	0.053	254321	0	254321	NA
PIER 3	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.080
PIER 4	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.080
PIER 5	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.080
PIER 6	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.080
PIER 7	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.080
PIER 8	FIXED	12.00	6.50	2.17	2.995	1062	0	1062	0.013
PIER 9	FIXED	12.00	6.50	5.83	1.115	8311	0	8311	0.104
PIER 10	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.080
PIER 11	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.080
PIER 12	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.080
PIER 13	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.080
PIER 14	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.080
PIER 15	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.080
					0.000	0	0	0	0.000
Lremain =				63.00	TOTAL (PIERS ONLY) =			79976	1.000
					WALL RIGIDITY =			68357	(K/IN)

## WALL PORTION: PIER (17-29)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	125.67	0.080	167768	0	167768	NA
SOLID STRIP	FIXED	12.00	6.50	125.67	0.052	258441	0	258441	NA
PIER 17	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 18	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 19	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 20	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 21	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 22	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 23	FIXED	12.00	6.50	7.83	0.830	12934	0	12934	0.153
PIER 24	FIXED	12.00	6.50	2.17	2.995	1062	0	1062	0.013
PIER 25	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 26	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 27	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 28	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 29	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
Lremain =				65.00	TOTAL (PIERS ONLY) =			84599	1.000
					WALL RIGIDITY =			71882	(K/IN)

## WALL PORTION: PIER (30-31)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	28.17	0.355	38068	0	38068	NA
SOLID STRIP	FIXED	12.00	6.50	28.17	0.231	56905	0	56905	NA
PIER 30	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.152
PIER 31	FIXED	12.00	6.50	18.17	0.358	35768	0	35768	0.848
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
Lremain =				23.17	TOTAL (PIERS ONLY) =			42186	1.000
					WALL RIGIDITY =			29536	(K/IN)

## WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	6.75	12.58	363.33	0.035	217278	0	217278	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			217278	(K/IN)



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 05/19/03  
TIME: 02:50 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2740 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 2ND FLOOR FRONT WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	2740.00	12.00	4353.96	12797.98	34489.2	0.63
PIER (1-2)	0.120	329.3	12.00	335.04	984.81	3293.4	0.79
PIER (3-15)	0.278	762.2	12.00	1481.04	4353.35	7621.9	0.41
PIER 16	0.189	517.6	12.00	425.04	1249.36	5176.3	0.98
PIER (17-29)	0.293	801.5	12.00	1505.04	4423.90	8015.0	0.43
PIER (30-31)	0.120	329.3	12.00	335.04	984.81	3293.4	0.79
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

2740.0

WALL PORTION: PIER (1-2)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 1	0.848	279.2	12.00	215.04	632.09	907.50	0.27
PIER 2	0.152	50.1	12.00	57.00	167.55	162.85	0.18
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

329.3

WALL PORTION: PIER (3-15)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 3	0.080	61.2	12.00	57.00	167.55	198.80	0.22
PIER 4	0.080	61.2	12.00	57.00	167.55	198.80	0.22
PIER 5	0.080	61.2	12.00	57.00	167.55	198.80	0.22
PIER 6	0.080	61.2	12.00	57.00	167.55	198.80	0.22
PIER 7	0.080	61.2	12.00	57.00	167.55	198.80	0.22
PIER 8	0.013	10.1	12.00	23.04	67.72	32.91	0.09
PIER 9	0.104	79.2	12.00	66.96	196.82	257.42	0.25
PIER 10	0.080	61.2	12.00	57.00	167.55	198.80	0.22
PIER 11	0.080	61.2	12.00	57.00	167.55	198.80	0.22
PIER 12	0.080	61.2	12.00	57.00	167.55	198.80	0.22
PIER 13	0.080	61.2	12.00	57.00	167.55	198.80	0.22
PIER 14	0.080	61.2	12.00	57.00	167.55	198.80	0.22
PIER 15	0.080	61.2	12.00	57.00	167.55	198.80	0.22
	0.000	0.0		0.00	0.00	0.00	0.00

762.2

## WALL PORTION: PIER (17-29)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 17	0.076	60.8	12.00	57.00	167.55	197.63	0.22
PIER 18	0.076	60.8	12.00	57.00	167.55	197.63	0.22
PIER 19	0.076	60.8	12.00	57.00	167.55	197.63	0.22
PIER 20	0.076	60.8	12.00	57.00	167.55	197.63	0.22
PIER 21	0.076	60.8	12.00	57.00	167.55	197.63	0.22
PIER 22	0.076	60.8	12.00	57.00	167.55	197.63	0.22
PIER 23	0.153	122.5	12.00	90.96	267.37	398.26	0.28
PIER 24	0.013	10.1	12.00	23.04	67.72	32.71	0.09
PIER 25	0.076	60.8	12.00	57.00	167.55	197.63	0.22
PIER 26	0.076	60.8	12.00	57.00	167.55	197.63	0.22
PIER 27	0.076	60.8	12.00	57.00	167.55	197.63	0.22
PIER 28	0.076	60.8	12.00	57.00	167.55	197.63	0.22
PIER 29	0.076	60.8	12.00	57.00	167.55	197.63	0.22
1.000		801.5					

## WALL PORTION: PIER (30-31)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 30	0.152	60.1	12.00	57.00	167.55	162.85	0.18
PIER 31	0.848	279.2	12.00	215.04	632.09	907.50	0.27
	0.000	0.0		0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
1.000		329.3					



## WALL PORTION: PIER (17-29)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	125.67	0.080	139807	0	139807	NA
SOLID STRIP	FIXED	10.00	6.50	125.67	0.052	215368	0	215368	NA
PIER 17	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 18	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 19	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 20	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 21	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 22	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 23	FIXED	10.00	6.50	7.83	0.830	10779	0	10779	0.153
PIER 24	FIXED	10.00	6.50	2.17	2.995	885	0	885	0.013
PIER 25	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 26	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 27	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 28	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 29	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076

Lremain = 65.00 TOTAL (PIERS ONLY) = 70499 1.000  
WALL RIGIDITY = 59902 (K/IN)

## WALL PORTION: PIER (30-31)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	28.17	0.355	30057	0	30057	NA
SOLID STRIP	FIXED	10.00	6.50	28.17	0.231	47421	0	47421	NA
PIER 30	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.152
PIER 31	FIXED	10.00	6.50	18.17	0.358	29806	0	29806	0.848
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

Lremain = 23.17 TOTAL (PIERS ONLY) = 35155 1.000  
WALL RIGIDITY = 24614 (K/IN)

## WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	5.63	12.58	363.33	0.035	180994	0	180994	NA
SOLID STRIP	CANT	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

TOTAL (PIERS ONLY) = 0 0.000  
WALL RIGIDITY = 180994 (K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 02/04/03  
TIME: 02:42 PM

CONCRETE OR MASONRY (C/M) = C REINFORCING STRENGTH\*1.25,  $F_y$  75000 PSI  
MATERIAL STRENGTH\*1.25,  $F'_c$  OR  $F'_m$  = 3750 PSI SHEAR DEMAND MODIFIER,  $m$  = 2  
FLEXURE DEMAND MODIFIER,  $m$  = 2

TOTAL WALL SHEAR = 1228 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 3RD FLOOR FRONT WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
SOLID WALL	1.00	1228.00	10.00	4353.96	10664.98	15448.2	0.28
PIER (1-2)	0.120	147.6	10.00	335.04	820.68	1476.0	0.35
PIER (3-15)	0.278	341.8	10.00	1481.04	3627.79	3416.0	0.18
PIER 16	0.189	232.0	10.00	425.04	1041.13	2319.9	0.44
PIER (17-29)	0.293	359.2	10.00	1505.04	3686.58	3592.1	0.19
PIER (30-31)	0.120	147.6	10.00	335.04	820.68	1476.0	0.35
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1228.0

WALL PORTION: PIER (1-2)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
PIER 1	0.848	125.1	10.00	215.04	526.74	406.72	0.12
PIER 2	0.152	22.5	10.00	57.00	139.62	72.98	0.08
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

147.6

WALL PORTION: PIER (3-15)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
PIER 3	0.080	27.4	10.00	57.00	139.62	89.10	0.10
PIER 4	0.080	27.4	10.00	57.00	139.62	89.10	0.10
PIER 5	0.080	27.4	10.00	57.00	139.62	89.10	0.10
PIER 6	0.080	27.4	10.00	57.00	139.62	89.10	0.10
PIER 7	0.080	27.4	10.00	57.00	139.62	89.10	0.10
PIER 8	0.013	4.5	10.00	23.04	56.44	14.75	0.04
PIER 9	0.104	35.5	10.00	66.96	164.02	115.37	0.11
PIER 10	0.080	27.4	10.00	57.00	139.62	89.10	0.10
PIER 11	0.080	27.4	10.00	57.00	139.62	89.10	0.10
PIER 12	0.080	27.4	10.00	57.00	139.62	89.10	0.10
PIER 13	0.080	27.4	10.00	57.00	139.62	89.10	0.10
PIER 14	0.080	27.4	10.00	57.00	139.62	89.10	0.10
PIER 15	0.080	27.4	10.00	57.00	139.62	89.10	0.10
	0.000	0.0		0.00	0.00	0.00	0.00

341.6

## WALL PORTION: PIER (17-29)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 17	0.076	27.3	10.00	57.00	139.62	88.57	0.10
PIER 18	0.076	27.3	10.00	57.00	139.62	88.57	0.10
PIER 19	0.076	27.3	10.00	57.00	139.62	88.57	0.10
PIER 20	0.076	27.3	10.00	57.00	139.62	88.57	0.10
PIER 21	0.076	27.3	10.00	57.00	139.62	88.57	0.10
PIER 22	0.076	27.3	10.00	57.00	139.62	88.57	0.10
PIER 23	0.153	54.9	10.00	90.98	222.81	178.49	0.13
PIER 24	0.013	4.5	10.00	23.04	56.44	14.66	0.04
PIER 25	0.076	27.3	10.00	57.00	139.62	88.57	0.10
PIER 26	0.076	27.3	10.00	57.00	139.62	88.57	0.10
PIER 27	0.076	27.3	10.00	57.00	139.62	88.57	0.10
PIER 28	0.076	27.3	10.00	57.00	139.62	88.57	0.10
PIER 29	0.076	27.3	10.00	57.00	139.62	88.57	0.10
	1.000	359.2					

## WALL PORTION: PIER (30-31)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 30	0.152	22.5	10.00	57.00	139.62	72.98	0.08
PIER 31	0.848	125.1	10.00	215.04	526.74	406.72	0.12
	0.000	0.0		0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	1.000	147.6					

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 05/19/03  
TIME: 02:29 PM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	363.33	0.035	450651	0	450651	NA
SOLID STRIP	FIXED	14.00	4.50	363.33	0.012	1260290	0	1260290	NA
PIER 1	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 2	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 3	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 4	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 5	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 6	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 7	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 8	FIXED	14.00	4.50	7.67	0.587	23694	0	23694	0.040
PIER 9	FIXED	14.00	4.50	11.00	0.409	36006	0	36006	0.061
PIER 10	FIXED	14.00	4.50	7.67	0.587	23694	0	23694	0.040
PIER 11	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 12	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 13	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 14	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 15	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 16	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 17	FIXED	14.00	4.50	12.17	0.370	40251	0	40251	0.068
PIER 18	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 19	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 20	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 21	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 22	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 23	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 24	FIXED	14.00	4.50	7.67	0.587	23694	0	23694	0.040
PIER 25	FIXED	14.00	4.50	11.00	0.409	36006	0	36006	0.061
PIER 26	FIXED	14.00	4.50	7.67	0.587	23694	0	23694	0.040
PIER 27	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 28	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 29	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 30	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 31	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 32	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 33	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
					0.000	0			0.000
					0.000	0			0.000

L<sub>remain</sub> = 203.37 TOTAL (PIERS ONLY) = 589771 1.000  
THK<sub>red</sub> = 11.80 WALL RIGIDITY = 320398 (K/IN)

13110

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	9.95	12.58	363.33	0.035	320413	0	320413	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			320413	(K/IN)



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 05/19/03  
TIME: 02:29 PM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH\*1.25, F'<sub>c</sub> OR F'<sub>m</sub> = 3750 PSI  
REINFORCING STRENGTH\*1.25, F<sub>y</sub> 75000 PSI  
SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 4097 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: GROUND FLOOR BACK WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
SOLID WALL	1.00	4097.00	14.00	4353.96	14930.97	51540.3	0.95
PIER 1	0.032	131.6	14.00	74.04	253.90	296.1	0.32
PIER 2	0.032	131.6	14.00	74.04	253.90	296.1	0.32
PIER 3	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 4	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 5	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 6	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 7	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 8	0.040	164.6	14.00	89.04	305.34	370.3	0.33
PIER 9	0.061	250.1	14.00	129.00	442.38	562.8	0.35
PIER 10	0.040	164.6	14.00	89.04	305.34	370.3	0.33
PIER 11	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 12	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 13	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 14	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 15	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 16	0.032	131.6	14.00	74.04	253.90	296.1	0.32
PIER 17	0.068	279.6	14.00	143.04	490.53	629.1	0.35
PIER 18	0.032	131.6	14.00	74.04	253.90	296.1	0.32
PIER 19	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 20	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 21	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 22	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 23	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 24	0.040	164.6	14.00	89.04	305.34	370.3	0.33
PIER 25	0.061	250.1	14.00	129.00	442.38	562.8	0.35
PIER 26	0.040	164.6	14.00	89.04	305.34	370.3	0.33
PIER 27	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 28	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 29	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 30	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 31	0.023	93.5	14.00	57.00	195.47	210.3	0.30
PIER 32	0.032	131.6	14.00	74.04	253.90	296.1	0.32
PIER 33	0.032	131.6	14.00	74.04	253.90	296.1	0.32
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

4097.0

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 05/19/03  
TIME: 02:51 PM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	363.33	0.035	450651	0	450651	NA
SOLID STRIP	FIXED	14.00	6.50	363.33	0.018	872456	0	872456	NA
PIER 1	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 2	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 3	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 4	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 5	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 6	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 7	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 8	FIXED	14.00	6.50	7.67	0.847	14660	0	14660	0.042
PIER 9	FIXED	14.00	6.50	11.00	0.591	23488	0	23488	0.067
PIER 10	FIXED	14.00	6.50	7.67	0.847	14660	0	14660	0.042
PIER 11	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 12	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 13	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 14	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 15	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 16	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 17	FIXED	14.00	6.50	12.17	0.534	26525	0	26525	0.076
PIER 18	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 19	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 20	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 21	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 22	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 23	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 24	FIXED	14.00	6.50	7.67	0.847	14660	0	14660	0.042
PIER 25	FIXED	14.00	6.50	11.00	0.591	23488	0	23488	0.067
PIER 26	FIXED	14.00	6.50	7.67	0.847	14660	0	14660	0.042
PIER 27	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 28	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 29	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 30	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 31	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 32	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 33	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
					0.000	0			0.000
					0.000	0			0.000

L<sub>remain</sub> = 203.37 TOTAL (PIERS ONLY) = 349619 1.000  
THK<sub>red</sub> = 10.82 WALL RIGIDITY = 254254 (K/IN)

B 113

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	7.90	12.58	363.33	0.035	254296	0	254296	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			254296	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 05/19/03  
TIME: 02:51 PM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH\*1.25, F<sub>c</sub> OR F<sub>m</sub> = 3750 PSI  
REINFORCING STRENGTH\*1.25, F<sub>y</sub> 75000 PSI  
SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 3125 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 2ND FLOOR BACK WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
SOLID WALL	1.00	3125.00	14.00	4353.96	14930.97	39312.5	0.72
PIER 1	0.032	100.9	14.00	74.04	253.90	327.9	0.36
PIER 2	0.032	100.9	14.00	74.04	253.90	327.9	0.36
PIER 3	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 4	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 5	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 6	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 7	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 8	0.042	131.0	14.00	89.04	305.34	425.9	0.38
PIER 9	0.067	209.9	14.00	129.00	442.38	682.3	0.42
PIER 10	0.042	131.0	14.00	89.04	305.34	425.9	0.38
PIER 11	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 12	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 13	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 14	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 15	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 16	0.032	100.9	14.00	74.04	253.90	327.9	0.36
PIER 17	0.076	237.1	14.00	143.04	490.53	770.5	0.43
PIER 18	0.032	100.9	14.00	74.04	253.90	327.9	0.36
PIER 19	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 20	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 21	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 22	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 23	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 24	0.042	131.0	14.00	89.04	305.34	425.9	0.38
PIER 25	0.067	209.9	14.00	129.00	442.38	682.3	0.42
PIER 26	0.042	131.0	14.00	89.04	305.34	425.9	0.38
PIER 27	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 28	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 29	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 30	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 31	0.021	66.9	14.00	57.00	195.47	217.5	0.31
PIER 32	0.032	100.9	14.00	74.04	253.90	327.9	0.36
PIER 33	0.032	100.9	14.00	74.04	253.90	327.9	0.36
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

1.000 3125.0

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 01/30/03  
TIME: 09:11 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	12.00	12.58	363.33	0.035	385777	0	385777	NA
SOLID STRIP	CANT	12.00	6.50	363.33	0.018	747563	0	747563	NA
PIER 1	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 2	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 3	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 4	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 5	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 6	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 7	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 8	FIXED	12.00	6.50	7.67	0.847	12566	0	12566	0.042
PIER 9	FIXED	12.00	6.50	11.00	0.591	20133	0	20133	0.067
PIER 10	FIXED	12.00	6.50	7.67	0.847	12566	0	12566	0.042
PIER 11	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 12	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 13	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 14	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 15	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 16	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 17	FIXED	12.00	6.50	12.17	0.534	22735	0	22735	0.076
PIER 18	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 19	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 20	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 21	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 22	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 23	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 24	FIXED	12.00	6.50	7.67	0.847	12566	0	12566	0.042
PIER 25	FIXED	12.00	6.50	11.00	0.591	20133	0	20133	0.067
PIER 26	FIXED	12.00	6.50	7.67	0.847	12566	0	12566	0.042
PIER 27	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 28	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 29	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 30	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 31	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 32	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 33	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
					0.000	0			0.000
					0.000	0			0.000
L <sub>remain</sub> =			203.37	TOTAL (PIERS ONLY) =			299674	1.000	
THK <sub>red</sub> =			9.27	WALL RIGIDITY =			217796	(K/IN)	

WALL PORTION: EQUIVALENT SOLID WALL

MARK	{CANT/ FIXED}	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	6.77	12.58	363.33	0.035	217771	0	217771	NA
SOLID STRIP	CANT	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =		0	0.000	
					WALL RIGIDITY =		217771	(K/IN)	

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 02/05/03  
TIME: 07:30 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI  
SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1432 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 3RD FLOOR BACK WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1432.00	12.00	4353.96	12797.98	18014.6	0.33
PIER 1	0.032	46.2	12.00	74.04	217.63	150.2	0.16
PIER 2	0.032	46.2	12.00	74.04	217.63	150.2	0.16
PIER 3	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 4	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 5	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 6	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 7	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 8	0.042	60.0	12.00	89.04	261.72	195.1	0.18
PIER 9	0.067	96.2	12.00	129.00	379.18	312.7	0.19
PIER 10	0.042	60.0	12.00	89.04	261.72	195.1	0.18
PIER 11	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 12	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 13	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 14	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 15	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 16	0.032	46.2	12.00	74.04	217.63	150.2	0.16
PIER 17	0.076	108.6	12.00	143.04	420.45	353.1	0.20
PIER 18	0.032	46.2	12.00	74.04	217.63	150.2	0.16
PIER 19	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 20	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 21	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 22	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 23	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 24	0.042	60.0	12.00	89.04	261.72	195.1	0.18
PIER 25	0.067	96.2	12.00	129.00	379.18	312.7	0.19
PIER 26	0.042	60.0	12.00	89.04	261.72	195.1	0.18
PIER 27	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 28	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 29	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 30	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 31	0.021	30.7	12.00	57.00	167.55	99.7	0.14
PIER 32	0.032	46.2	12.00	74.04	217.63	150.2	0.16
PIER 33	0.032	46.2	12.00	74.04	217.63	150.2	0.16
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

1.000 1432.0





## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 356

DATE: 05/19/03  
 TIME: 02:33 PM

CONCRETE OR MASONRY [C/M] = C  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1862 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: GROUND FLOOR SIDE WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1862.00	16.00	594.00	2328.00	23424.0	3.17
PIER 1	0.142	264.2	16.00	72.96	285.94	594.4	0.66
PIER 2	0.716	1333.6	16.00	324.96	1273.58	3000.6	0.74
PIER 3	0.142	264.2	16.00	72.96	285.94	594.4	0.66
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

1862.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 05/19/03  
TIME: 02:53 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR SIDE WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	50.00	0.252	60672	0	60672	NA
SOLID STRIP	FIXED	14.00	6.50	50.00	0.130	119357	0	119357	NA
PIER 1	FIXED	14.00	6.50	6.33	1.027	11043	0	11043	0.128
PIER 2	FIXED	14.00	6.50	27.33	0.238	64335	0	64335	0.744
PIER 3	FIXED	14.00	6.50	6.33	1.027	11043	0	11043	0.128
					0.000	0			0.000
					0.000	0			0.000
TOTAL (PIERS ONLY) =								86421	1.000
WALL RIGIDITY =								50825	(K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	11.73	12.58	50.00	0.252	50834	0	50834	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			50834	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 356

DATE: 05/19/03  
 TIME: 02:53 PM

CONCRETE OR MASONRY [C/M] = C  
 MATERIAL STRENGTH\*1.25, F'<sub>c</sub> OR F'<sub>m</sub> = 3750 PSI

REINFORCING STRENGTH\*1.25, F<sub>y</sub> 75000 PSI  
 SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1542 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 2ND FLOOR SIDE WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
SOLID WALL	1.00	1542.00	14.00	594.00	2037.00	19398.4	2.62
PIER 1	0.128	197.0	14.00	72.96	250.20	640.4	0.71
PIER 2	0.744	1147.9	14.00	324.96	1114.38	3730.7	0.92
PIER 3	0.128	197.0	14.00	72.96	250.20	640.4	0.71
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00
	1.000	1542.0					

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 01/29/03  
TIME: 06:15 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR SIDE WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	12.00	12.58	50.00	0.252	48770	0	48770	NA
SOLID STRIP	CANT	12.00	6.50	50.00	0.130	100497	0	100497	NA
PIER 1	FIXED	12.00	6.50	6.33	1.027	9466	0	9466	0.128
PIER 2	FIXED	12.00	6.50	27.33	0.238	55144	0	55144	0.744
PIER 3	FIXED	12.00	6.50	6.33	1.027	9466	0	9466	0.128
					0.000	0			0.000
					0.000	0			0.000
					TOTAL (PIERS ONLY) =			74075	1.000
					WALL RIGIDITY =			41573	(K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	10.23	12.58	50.00	0.252	41576	0	41576	NA
SOLID STRIP	CANT	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			41576	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356  
DATE: 02/05/03  
TIME: 07:31 AM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI  
REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 56.8 KIPS << Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION:	3RD FLOOR SIDE WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	56.80	12.00	594.00	1746.00	714.5	0.10
PIER 1	0.128	7.3	12.00	72.96	214.46	23.6	0.03
PIER 2	0.744	42.3	12.00	324.96	955.18	137.4	0.03
PIER 3	0.128	7.3	12.00	72.96	214.46	23.6	0.03
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00
	1.000	56.8					

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 02/04/03  
TIME: 01:53 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	50.00	0.252	60672	0	60672	NA
SOLID STRIP	FIXED	14.00	7.00	50.00	0.140	110726	0	110726	NA
PIER 1	FIXED	14.00	7.00	22.33	0.313	48108	0	48108	0.500
PIER 2	FIXED	14.00	7.00	22.33	0.313	48108	0	48108	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			96216	1.000
					WALL RIGIDITY =			56041	(K/IN)



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 356

DATE: 05/19/03  
 TIME: 02:39 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1543 KIPS

WALL PORTION:	GROUND FLOOR HALLWAY WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1543.00	14.00	594.00	2037.00	19410.9	2.62
PIER 1	0.500	771.5	14.00	264.96	908.62	5400.5	1.64
PIER 2	0.500	771.5	14.00	264.96	908.62	5400.5	1.64
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1543.0



### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 02/04/03  
TIME: 02:21 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: SECOND FLOOR HALLWAY WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	12.58	50.00	0.252	43337	0	43337	NA
SOLID STRIP	FIXED	10.00	7.00	50.00	0.140	79090	0	79090	NA
PIER 1	FIXED	10.00	7.00	22.33	0.313	34363	0	34363	0.500
PIER 2	FIXED	10.00	7.00	22.33	0.313	34363	0	34363	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			68725	1.000
					WALL RIGIDITY =			40029	(K/IN)



RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 05/19/03  
TIME: 02:56 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1125 KIPS

WALL PORTION: SECOND FLOOR HALLWAY WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1125.00	10.00	594.00	1455.00	14152.5	1.91
PIER 1	0.500	562.5	10.00	264.96	649.02	3937.5	1.20
PIER 2	0.500	562.5	10.00	264.96	649.02	3937.5	1.20
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1125.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 01/30/03  
TIME: 06:39 AM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: THIRD FLOOR HALLWAY WALL

[illegible]

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	7.40	12.58	50.00	0.252	32069	0	32069	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			32069	(K/IN)

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 02/04/03  
TIME: 01:50 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY $E_c$	3122 KSI
MATERIAL STRENGTH, $F'_c$ OR $F'_m$ =	3000 PSI	SHEAR MODULUS $G_c$	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY WALL w/ DOOR

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	50.00	0.252	60672	0	60672	NA
SOLID STRIP	FIXED	14.00	7.00	50.00	0.140	110726	0	110726	NA
PIER 1	FIXED	14.00	7.00	23.33	0.300	50406	0	50406	0.500
PIER 2	FIXED	14.00	7.00	23.33	0.300	50406	0	50406	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			100811	1.000
					WALL RIGIDITY =			57569	(K/IN)



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 356

DATE: 05/19/03  
 TIME: 02:38 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1452 KIPS

WALL PORTION:	GROUND FLOOR HALLWAY WALL w/ DOOR						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1452.00	14.00	594.00	2037.00	18266.2	2.47
PIER 1	0.500	726.0	14.00	276.96	949.77	5082.0	1.47
PIER 2	0.500	726.0	14.00	276.96	949.77	5082.0	1.47
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1452.0





## WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	9.49	12.58	50.00	0.252	41127	0	41127	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			41127	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 356

DATE: 05/19/03  
 TIME: 02:55 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1063 KIPS

WALL PORTION:	SECOND FLOOR HALLWAY WALL w/ DOOR						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1063.00	10.00	594.00	1455.00	13372.5	1.81
PIER 1	0.500	531.5	10.00	276.96	678.41	3720.5	1.08
PIER 2	0.500	531.5	10.00	276.96	678.41	3720.5	1.08
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1063.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 356

DATE: 01/30/03  
TIME: 06:40 AM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F'c OR F'm =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: THIRD FLOOR HALLWAY WALL w/ DOOR

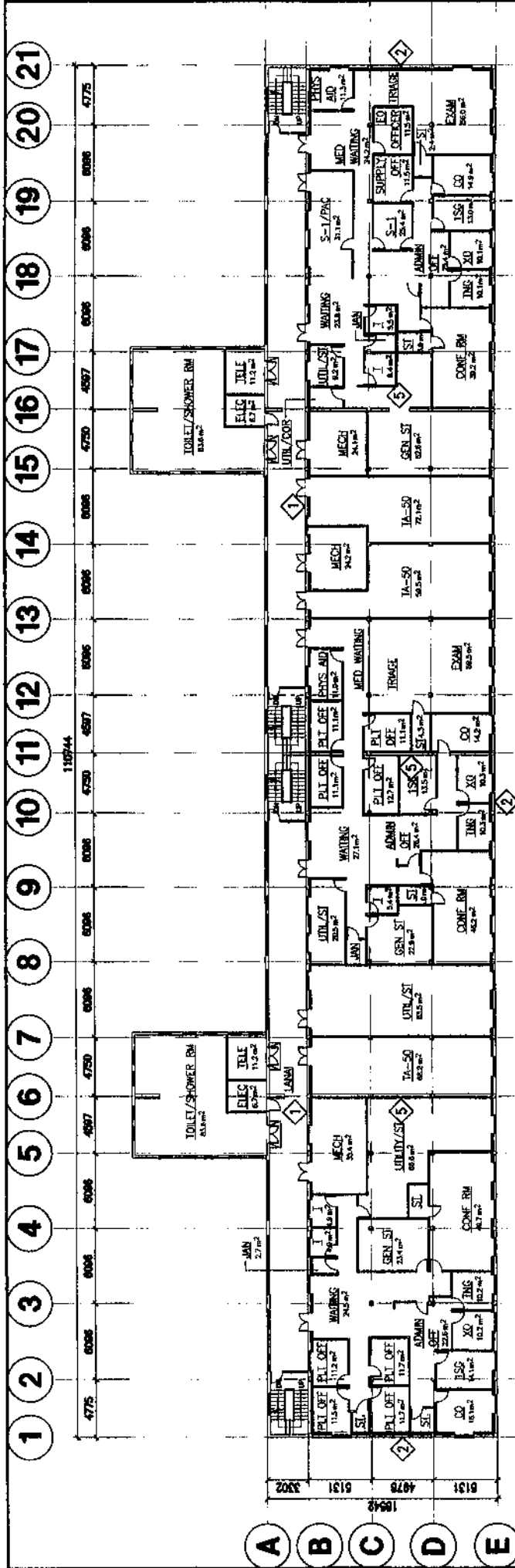
MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	8.00	12.58	50.00	0.252	32513	0	32513	NA
SOLID STRIP	CANT	8.00	7.00	50.00	0.140	61979	0	61979	NA
PIER 1	FIXED	8.00	7.00	23.33	0.300	28803	0	28803	0.500
PIER 2	FIXED	8.00	7.00	23.33	0.300	28803	0	28803	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			57606	1.000
					WALL RIGIDITY =			31268	(K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

B139

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	7.58	12.58	50.00	0.252	32849	0	32849	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			32849	(K/IN)





**BUILDING 357 - SECOND FLOOR PLAN**

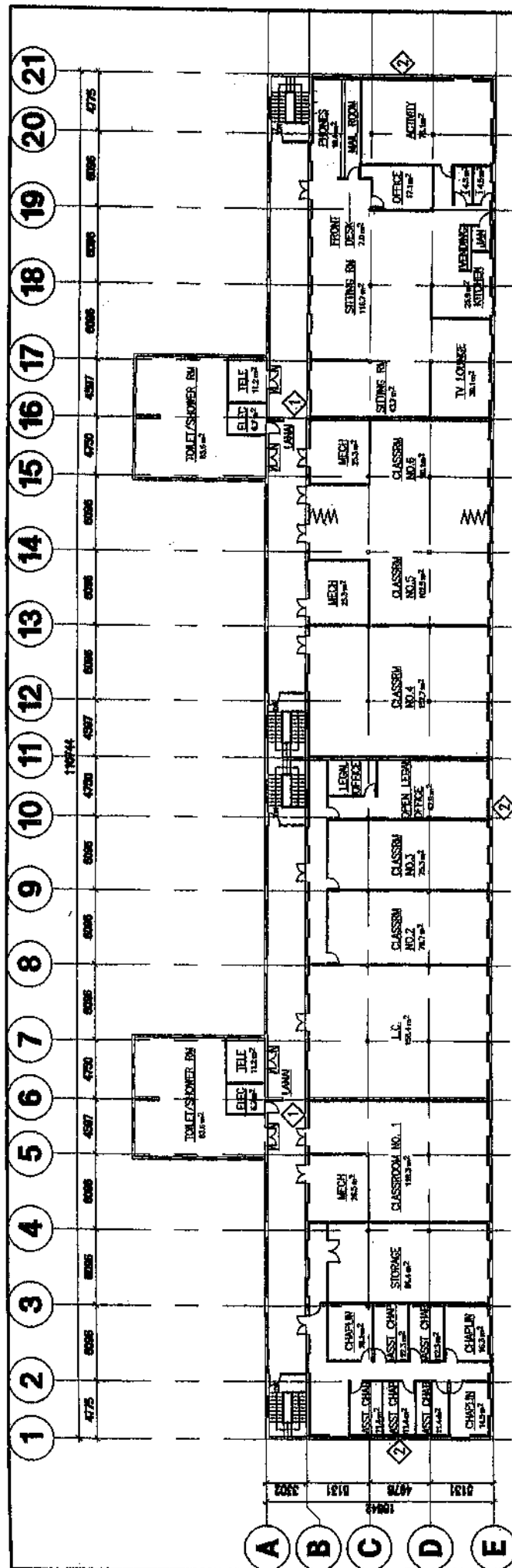
**SHEARWALL RETROFIT SCHEDULE**

DESIGNATION	DESCRIPTION
1	RETROFIT 4" SHOTCRETE WALL
2	RETROFIT 6" SHOTCRETE WALL
3	NEW 10" CONCRETE WALL
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	

MITSUNAGA & ASSOCIATES  
747 AMANA STREET, STE. 216  
HONOLULU, HAWAII 96814



SEISMIC EVALUATION and REHABILITATION REPORT  
for QUAD "C" WHOLE BARRACKS RENEWAL  
SCHOFIELD BARRACKS, OAHU, HAWAII  
BUILDING 357, SECOND FLOOR PLAN  
SCALE: NO SCALE DATE: FEBRUARY 6, 2003



**BUILDING 357 - THIRD FLOOR PLAN**

[illegible]

**MTSUNAGA & ASSOCIATES**  
747 AMANA STREET, STE. 216  
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT  
for QUAD "C" WHOLE BARRACKS RENEWAL  
SCHOFIELD BARRACKS, OAHU, HAWAII  
BUILDING 357, THIRD FLOOR PLAN

SCALE: NO SCALE	DATE: FEBRUARY 6, 2003
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PROJ: QUAD C, BUILDING 357  
TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003  
TIME: 01:12 PM P.M.

$$V = C1 \cdot C2 \cdot C3 \cdot S_a \cdot W$$

$$T = C_t \cdot (h_n)^{3/4}$$

$$S_{xs} = 2/3 \cdot F_a \cdot S_s$$

$$S_{x1} = 2/3 \cdot F_v \cdot S_1$$

$$T_0 = (S_{x1} \cdot B_s / S_{xs} \cdot B_1)$$

SHORT PERIOD SPECTRAL RESPONSE ACCELERATION PARAMETER,  $S_s = 0.60$   
SPECTRAL RESPONSE ACCELERATION PARAMETER AT 1 SEC,  $S_1 = 0.17$

PERFORMANCE LEVEL [IO,SE,LS,CP] =	IO	$B_s =$	1.00
SOIL CLASS [A, B, C, D, E, F] =	E	$B_1 =$	1.00
% DAMPING =	5.000	$T_0 =$	0.62
SITE COEFFICIENT, $F_a =$	1.5	$C_1 =$	1.28
SITE COEFFICIENT, $F_v =$	3.3	$C_2 =$	1.00
$C_t$ FACTOR [0.035,0.030,0.020,0.060] =	0.020	$C_3 =$	1.00

DESIGN SHORT PERIOD RESPONSE ACCELERATION PARAMETER,  $S_{xs} = 0.60$   
DESIGN RESPONSE ACCELERATION PARAMETER AT 1 SEC,  $S_{x1} = 0.37$

RESPONSE SPECTRAL ACCELERATION (AT PERIOD T),  $S_a = 0.60$

TOTAL BUILDING HEIGHT = 41.66 FT  
BUILDING SEISMIC WEIGHT, W = 9918 KIPS

	T (SEC)	k	BASE V (KIPS)
LINEAR STATIC METHOD	0.33	1.00	7625.45

BASE SHEAR COEFFICIENT = 0.7688 x W  
TOTAL DESIGN BASE SHEAR = 7625.4 KIPS

$C_t$	LATERAL SYSTEM	%damping	$B_s$	$B_1$
0.035	Steel Moment Resisting Frames	2.00	0.80	0.80
0.030	RC Moment Resisting Frames	5.00	1.00	1.00
0.030	Eccentrically Braced Frames	10.00	1.20	1.20
0.020	All Oher Buildings			
0.060	Wood Buildings			

PROJ: QUAD C, BUILDING 357 DATE: 03-Feb 2003  
 TITLE: w/ SHEAR WALL RETROFIT TIME: 01:12 PM P.M.

CLASS SITE DESCRIPTION - SOIL PROFILES

A HARD ROCK, SHEAR WAVE VELOCITY  $V_s > 5000$  FT/S.  
 B ROCK, SHEAR WAVE VELOCITY  $V_s$  FROM 2500 TO 5000 FT/S.  
 C VERY DENSE SOIL AND SOFT ROCK, SHEAR WAVE VELOCITY  
 $V_s$  FROM 1200 TO 2500 FT/S.  
 D STIFF SOIL, SHEAR WAVE VELOCITY  $V_s$  FROM 600 TO 1200 FT/S.  
 E SOFT SOIL, SHEAR WAVE VELOCITY  $V_s < 600$  FT/S.  
 (ASSUME CLASS E IF NO INFORMATION IS AVAILABLE.)  
 F SOIL REQUIRING SITE-SPECIFIC EVALUATION.

SITE COEFFICIENT,  $F_a$  (Based on Site Class & Spectral Response Acceleration  $S_s$ )

C L A S S	SPECTRAL RESPONSE ACCELERATION, $S_s$				
	0.25	0.50	0.75	1.00	1.25
A	0.80	0.80	0.80	0.80	0.80
B	1.00	1.00	1.00	1.00	1.00
C	1.20	1.20	1.10	1.00	1.00
D	1.60	1.40	1.20	1.10	1.00
E	2.50	1.70	1.20	0.90	NA
F	NA	NA	NA	NA	NA

SITE COEFFICIENT,  $F_v$  (Based on Site Class & Spectral Response Acceleration  $S_1$ )

C L A S S	SPECTRAL RESPONSE ACCELERATION, $S_1$				
	0.10	0.20	0.30	0.40	0.50
A	0.80	0.80	0.80	0.80	0.80
B	1.00	1.00	1.00	1.00	1.00
C	1.70	1.60	1.50	1.40	1.30
D	2.40	2.00	1.80	1.60	1.50
E	3.50	3.20	2.80	2.40	NA
F	NA	NA	NA	NA	NA

PROJ: QUAD C, BUILDING 357  
 TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003  
 TIME: 01:12 PM P.M.

## INCH-POUND UNITS:

LEVEL	WEIGHT (kips)	DH (ft)	HEIGHT (ft)	W*H/1000 (ft-k)	FORCE (kips)	SHEAR (klps)	V*DH (ft-k)	MOMENT (ft-k)
	0		0.0	0	0.0			0
		0.0				0.0	0	
	0		0.0	0	0.0			0
		0.0				0.0	0	
ROOF	1875		41.7	78	2616.2			0
		16.5				2616.2	43167	
3RD	3846		25.2	97	3240.9			43167
		12.6				5857.1	73682	
2ND	4197		12.6	53	1768.3			116849
		12.6				7625.4	95928	
GRND				0	0.0			212778
	9918	41.7		228	7625.4		212778	

## SEISMIC WEIGHT DETERMINATION

PAGE 1

PROJECT: QUAD C, BUILDING 357 (w/ retrofit)      DATE: 02/03/03  
 TITLE: ROOF      TIME: 11:37 AM

FLOORS: (ROOF)	DESCRIPTION	WEIGHT (ksf)	AREA (ft2)	TOTAL (kips)
	ROOF	0.018	25054	438.45
		0.000	0	0.00
		0.000	0	0.00
		0.000	0	0.00
				438.45

BEAMS: (ROOF)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	6.50	70.00	0.474	364.00	1.00	172.52
GRID B	8.00	10.00	0.083	364.00	1.00	30.33
GRID C	10.00	10.00	0.104	364.00	1.00	37.92
GRID D	10.00	10.00	0.104	364.00	1.00	37.92
GRID E	8.50	70.00	0.474	364.00	1.00	172.52
TRANS	10.00	10.00	0.104	80.83	19.00	120.39
TRANS-C to D	12.50	12.50	0.163	80.83	19.00	188.11
GRID 1, 21	6.50	70.00	0.474	50.00	2.00	47.40
						807.11

COLUMNS: (ROOF)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	10.00	48.00	0.500	5.58	8.00	22.32
GRID C	16.00	16.00	0.267	5.58	19.00	28.27
GRID D	16.00	16.00	0.267	5.58	19.00	28.27
GRID E	4.00	10.00	0.042	5.58	19.00	4.42
GRID B	4.00	10.00	0.042	5.58	19.00	4.42
	0.00	0.00	0.000	0.00	0.00	0.00
						87.70

WALLS: (ROOF)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (kips)
GRID B	7.82	150.00	0.098	364.00	5.58	198.54
GRID E	9.27	150.00	0.116	364.00	5.58	235.36
GRID A	10.00	150.00	0.125	34.83	5.58	24.29
GRID 1	12.00	150.00	0.150	50.00	5.58	41.85
GRID 21	12.00	150.00	0.150	50.00	5.58	41.85
GRID	0.00	150.00	0.000	50.00	5.58	0.00
GRID	0.00	150.00	0.000	50.00	5.58	0.00
GRID	0.00	150.00	0.000	50.00	5.58	0.00
	0.00	150.00	0.000	0.00	5.58	0.00
						541.89

FLOORS	438.45 kips
BEAMS	807.11 kips
COLUMNS	87.70 kips
WALLS	541.89 kips

1875.15 kips

## SEISMIC WEIGHT DETERMINATION

PAGE 2

PROJECT: QUAD C, BUILDING 357 (w/ retrofit) DATE: 02/03/03  
 TITLE: 3RD FL TIME: 11:37 AM

FLOORS: (3RD FL)	DESCRIPTION	WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (kips)
	TYPICAL FLOOR	0.101	18200	1838.20
	BALCONY	0.078	3942	307.49
	STAIRS (add to balcony)	0.092	253	23.26
	STAIRS (add to balcony)	0.092	217	19.93

2188.87

BEAMS: (3RD FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	6.00	27.00	0.169	364.00	1.00	61.43
GRID C	12.00	14.00	0.175	364.00	1.00	63.70
GRID D	12.00	14.00	0.175	364.00	1.00	63.70
	0.00	0.00	0.000	0.00	0.00	0.00
	0.00	0.00	0.000	0.00	0.00	0.00

188.83

COLUMNS: (3RD FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	10.00	48.00	0.500	5.58	8.00	22.32
GRID C	16.00	16.00	0.267	5.58	19.00	28.27
GRID D	16.00	16.00	0.267	5.58	19.00	28.27
GRID E	4.00	10.00	0.042	5.58	19.00	4.42
GRID B	4.00	10.00	0.042	5.58	19.00	4.42
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	10.00	0.042	6.04	19.00	4.78
GRID B	4.00	10.00	0.042	6.04	19.00	4.78

149.06

WALLS: (3RD FL)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (kips)
GRID B	7.82	150.00	0.098	364.00	5.58	198.54
GRID E	9.27	150.00	0.116	364.00	5.58	235.36
GRID A	10.00	150.00	0.125	34.83	5.58	24.29
GRID 1	12.00	150.00	0.150	50.00	5.58	41.85
GRID 21	12.00	150.00	0.150	50.00	5.58	41.85
	0.00	150.00	0.000	0.00	0.00	0.00
GRID B	9.38	150.00	0.117	364.00	6.04	257.78
GRID E	10.82	150.00	0.135	364.00	6.04	297.36
GRID A	10.00	150.00	0.125	34.83	6.04	26.30
GRID 1	14.00	150.00	0.175	50.00	6.04	52.85
GRID 21	14.00	150.00	0.175	50.00	6.04	52.85
GRID 6	8.00	150.00	0.100	50.00	6.04	30.20
GRID 11	8.00	150.00	0.100	50.00	6.04	30.20
GRID 18	8.00	150.00	0.100	50.00	6.04	30.20
	8.00	150.00	0.100	0.00	0.00	0.00
	8.00	150.00	0.100	0.00	0.00	0.00

1319.62

FLOORS 2188.87 kips  
 BEAMS 188.83 kips  
 COLUMNS 149.06 kips  
 WALLS 1319.62 kips

3846.38 kips

## SEISMIC WEIGHT DETERMINATION

PAGE 3

PROJECT: QUAD C, BUILDING 357 (w/ retrofit) DATE: 02/03/03  
 TITLE: 2ND FL TIME: 11:37 AM

FLOORS: (2ND FL)	DESCRIPTION	WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (kips)
	TYPICAL FLOOR	0.101	18200	1838.20
	BALCONY	0.078	3942	307.49
	STAIRS (add to balcony)	0.092	253	23.26
	STAIRS (add to balcony)	0.092	217	19.93
				2188.87

BEAMS: (2ND FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	6.00	27.00	0.169	364.00	1.00	61.43
GRID C	12.00	14.00	0.175	364.00	1.00	63.70
GRID D	12.00	14.00	0.175	364.00	1.00	63.70
	0.00	0.00	0.000	0.00	0.00	0.00
	0.00	0.00	0.000	0.00	0.00	0.00
						188.83

COLUMNS: (2ND FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	10.00	0.042	6.04	19.00	4.78
GRID B	4.00	10.00	0.042	6.04	19.00	4.78
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	10.00	0.042	6.04	19.00	4.78
GRID B	4.00	10.00	0.042	6.04	19.00	4.78
	0.00	0.00	0.000	0.00	0.00	0.00
						122.73

WALLS: (2ND FL)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (kips)
GRID B	9.38	150.00	0.117	364.00	6.04	257.78
GRID E	10.82	150.00	0.135	364.00	6.04	297.36
GRID A	10.00	150.00	0.125	34.83	6.04	26.30
GRID 1	14.00	150.00	0.175	50.00	6.04	52.85
GRID 21	14.00	150.00	0.175	50.00	6.04	52.85
GRID 6	8.00	150.00	0.100	50.00	6.04	30.20
GRID 11	8.00	150.00	0.100	50.00	6.04	30.20
GRID 16	8.00	150.00	0.100	50.00	6.04	30.20
	0.00	150.00	0.000	0.00	0.00	0.00
GRID B	10.19	150.00	0.127	364.00	6.04	280.04
GRID E	13.48	150.00	0.169	364.00	6.04	370.46
GRID A	10.00	150.00	0.125	34.83	6.04	26.30
GRID 1	16.00	150.00	0.200	50.00	6.04	60.40
GRID 21	16.00	150.00	0.200	50.00	6.04	60.40
GRID 6	8.00	150.00	0.100	50.00	6.04	30.20
GRID 8	8.00	150.00	0.100	18.33	6.04	9.86
GRID 10	8.00	150.00	0.100	33.67	6.04	20.34
GRID 13	8.00	150.00	0.100	50.00	6.04	30.20
GRID 16	8.00	150.00	0.100	50.00	6.04	30.20
	0.00	150.00	0.000	0.00	0.00	0.00
						1696.13

FLOORS 2188.87 kips  
 BEAMS 188.83 kips  
 COLUMNS 122.73 kips  
 WALLS 1696.13 kips

4196.55 kips

## CENTER OF MASS DETERMINATION

PAGE 1

PROJECT: QUAD C, BUILDING 357 (w/ retrofit)  
 TITLE: ROOF

DATE: 02/03/03  
 TIME: 11:37 AM

FLOORS: (ROOF)	DESCRIPTION	WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	ROOF	438.45	182.00	30.42	79797	13335
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0
					79797	13335

BEAMS: (ROOF)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	172.52	182.00	60.42	31399	10424
	GRID B	30.33	182.00	49.58	5521	1504
	GRID C	37.92	182.00	33.17	6901	1258
	GRID D	37.92	182.00	16.83	6901	638
	GRID E	172.52	182.00	0.42	31399	72
	TRANS	120.39	182.00	30.42	21911	3662
	TRANS-C to D	188.11	182.00	25.00	34237	4703
	GRID 1, 21	47.40	182.00	30.42	8628	1442
					146894	23703

COLUMNS: (ROOF)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	22.32	182.00	60.42	4062	1349
	GRID C	28.27	182.00	33.17	5146	938
	GRID D	28.27	182.00	16.83	5146	476
	GRID E	4.42	182.00	0.67	804	3
	GRID B	4.42	182.00	49.33	804	218
		0.00	0.00	0.00	0	0
					15961	2983

WALLS: (ROOF)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID B	198.54	182.00	49.67	36135	9862
	GRID E	235.36	182.00	0.33	42835	78
	GRID A	24.29	182.00	60.50	4421	1470
	GRID 1	41.85	182.00	25.00	7617	1046
	GRID 21	41.85	182.00	25.00	7617	1046
	GRID	0.00	182.00	25.00	0	0
	GRID	0.00	182.00	25.00	0	0
	GRID	0.00	182.00	25.00	0	0
		0.00	0.00	0.00	0	0

WEIGHTX WEIGHTY 98624 13502

FLOORS	79797	13335	CENTER OF MASS X =	182.00
BEAMS	146894	23703	CENTER OF MASS Y =	28.54
COLUMNS	15961	2983		
WALLS	98624	13502		

341277.03 53522.84

## CENTER OF MASS DETERMINATION

PAGE 2

PROJECT: QUAD C, BUILDING 357 (w/ retrofit)  
 TITLE: 3RD FL

DATE: 02/03/03  
 TIME: 11:37 AM

FLOORS: (3RD FL)	DESCRIPTION	WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	TYPICAL FLOOR	1838.20	182.00	25.00	334552	45955
	BALCONY	307.49	182.00	55.42	55962	17039
	STAIRS (add to balcony)	23.26	182.00	55.42	4232	1289
	STAIRS (add to balcony)	19.93	131.67	58.12	2624	1158

397371 65441

BEAMS: (3RD FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	61.43	182.00	60.42	11179	3711
	GRID C	63.70	182.00	33.17	11593	2113
	GRID D	63.70	182.00	16.83	11593	1072
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

34366 6896

COLUMNS: (3RD FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	22.32	182.00	60.42	4062	1349
	GRID C	28.27	182.00	33.17	5146	938
	GRID D	28.27	182.00	16.83	5146	478
	GRID E	4.42	182.00	0.87	804	3
	GRID B	4.42	182.00	49.33	804	218
	GRID A	20.68	182.00	60.42	3764	1249
	GRID C	15.56	182.00	33.17	2832	516
	GRID D	15.56	182.00	16.83	2832	262
	GRID E	4.78	182.00	0.87	870	3
	GRID B	4.78	182.00	49.33	870	236

27130 5250

WALLS: (3RD FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID B	198.54	182.00	49.67	36135	9862
	GRID E	235.36	182.00	0.33	42835	78
	GRID A	24.29	182.00	60.50	4421	1470
	GRID 1	41.85	182.00	25.00	7617	1046
	GRID 21	41.85	182.00	25.00	7617	1046
		0.00	0.00	0.00	0	0
	GRID B	257.78	182.00	49.67	46916	12804
	GRID E	297.36	182.00	0.33	54119	98
	GRID A	26.30	182.00	60.50	4786	1591
	GRID 1	52.85	182.00	25.00	9619	1321
	GRID 21	52.85	182.00	25.00	9619	1321
	GRID 6	30.20	182.00	25.00	5496	755
	GRID 11	30.20	182.00	25.00	5496	755
	GRID 16	30.20	182.00	25.00	5496	755
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

WEIGHTX WEIGHTY

240172 32902

FLOORS	397371	65441
BEAMS	34366	6896
COLUMNS	27130	5250
WALLS	240172	32902

699038.57 110489.26

CENTER OF MASS X = 181.74  
 CENTER OF MASS Y = 28.73

Total center of mass X = 181.82  
 Total center of mass Y = 28.67



## CENTER OF MASS DETERMINATION

PAGE 3

PROJECT: QUAD C, BUILDING 357 (w/ retrofit)  
 TITLE: 2ND FL

DATE: 02/03/03  
 TIME: 11:37 AM

FLOORS: (2ND FL)	DESCRIPTION	WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	TYPICAL FLOOR	1838.20	182.00	25.00	334552	45955
	BALCONY	307.49	182.00	55.42	55982	17039
	STAIRS (add to balcony)	23.26	182.00	55.42	4232	1289
	STAIRS (add to balcony)	19.93	131.67	58.12	2624	1158
					397371	65441

BEAMS: (2ND FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	61.43	182.00	60.42	11179	3711
	GRID C	63.70	182.00	33.17	11593	2113
	GRID D	63.70	182.00	16.83	11593	1072
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0
					34366	6896

COLUMNS: (2ND FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	20.68	182.00	60.42	3764	1249
	GRID C	15.56	182.00	33.17	2832	516
	GRID D	15.56	182.00	16.83	2832	262
	GRID E	4.78	182.00	0.67	870	3
	GRID B	4.78	182.00	49.33	870	236
	GRID A	20.68	182.00	60.42	3764	1249
	GRID C	15.56	182.00	33.17	2832	516
	GRID D	15.56	182.00	16.83	2832	262
	GRID E	4.78	182.00	0.67	870	3
	GRID B	4.78	182.00	49.33	870	236
		0.00	0.00	0.00	0	0
					22337	4533

WALLS: (2ND FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID B	257.78	182.00	49.67	46916	12804
	GRID E	297.36	182.00	0.33	54119	98
	GRID A	26.30	182.00	60.50	4786	1591
	GRID 1	52.85	182.00	25.00	9619	1321
	GRID 21	52.85	182.00	25.00	9619	1321
	GRID 6	30.20	182.00	25.00	5496	755
	GRID 11	30.20	182.00	25.00	5496	755
	GRID 16	30.20	182.00	25.00	5496	755
		0.00	0.00	0.00	0	0
	GRID B	280.04	182.00	49.67	50968	13910
	GRID E	370.46	182.00	0.33	67423	122
	GRID A	26.30	182.00	60.50	4786	1591
	GRID 1	60.40	182.00	25.00	10993	1510
	GRID 21	60.40	182.00	25.00	10993	1510
	GRID 6	30.20	90.75	25.00	2741	755
	GRID 8	9.86	146.33	25.00	1443	247
	GRID 10	20.34	146.33	25.00	2976	508
	GRID 13	30.20	217.00	25.00	6553	755
	GRID 16	30.20	272.58	25.00	8232	755
		0.00	0.00	0.00	0	0
					308655	41063

	WEIGHTX	WEIGHTY		
FLOORS	397371	65441	CENTER OF MASS X =	181.75
BEAMS	34366	6896	CENTER OF MASS Y =	28.10
COLUMNS	22337	4533		
WALLS	308655	41063	Total center of mass X =	181.79
			Total center of mass Y =	28.43

762729.04 117934.16

## Rigid Diaphragm Torsional Analysis

Description QUAD C, BUILDING 357 -- 2ND FLOOR DIAPHRAGM (REV)

## General Information

Y-Y Axis Shear	7,625.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	181.79 ft
X-X Axis Shear	7,625.00 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	28.10 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	8.230	363.330	12.580	182.000	50.000	0.0	Fix-Fix	1.0
2	9.950	363.330	12.580	182.000	0.000	0.0	Fix-Fix	1.0
3	14.400	50.000	12.580	0.000	25.000	90.0	Fix-Fix	1.0
4	14.400	50.000	12.580	363.330	25.000	90.0	Fix-Fix	1.0
5	8.670	50.000	12.580	90.750	25.000	90.0	Fix-Fix	1.0
6	14.000	16.330	12.580	126.330	25.000	90.0	Fix-Fix	1.0
7	14.000	16.830	12.580	166.330	25.000	90.0	Fix-Fix	1.0
8	14.000	16.830	12.580	166.330	25.000	90.0	Fix-Fix	1.0
9	12.640	50.000	12.580	217.000	25.000	90.0	Fix-Fix	1.0
10	11.200	50.000	12.580	272.580	25.000	90.0	Fix-Fix	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	8.481	3,414.275	88.253	3,502.528
2	8.481	4,127.830	-88.437	4,127.830
3	-22.656	1,475.527	377.908	1,853.436
4	13.677	1,475.527	216.821	1,692.349
5	-22.656	888.390	116.685	1,005.076
6	-22.656	391.703	32.286	423.989
7	-22.656	408.080	11.193	419.274
8	-22.656	408.080	11.193	419.274
9	13.677	1,295.185	33.023	1,328.208
10	13.677	1,147.632	82.200	1,229.833

## Summary

X Distance to Center of Rigidity	186.280 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear	
Y Distance to Center of Rigidity	22.660 ft	Xcm + .05*Max-X - X-cr =	13.677 ft Torsion = 104283.85 k-ft
		Xcm - .05*Max-X - X-cr =	-22.656 ft Torsion = -172755.28 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear	
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr =	8.481 ft Torsion = 64,667.80 k-ft
		Ycm - .05*Max-Y - Y-cr =	2.398 ft Torsion = 18,284.92 k-ft

## Rigid Diaphragm Torsional Analysis

Description QUAD C, BUILDING 357 -- 3RD FLOOR DIAPHRAGM

## General Information

Y-Y Axis Shear	5,857.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	181.82 ft
X-X Axis Shear	5,857.00 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	28.69 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	6.750	363.330	12.580	182.000	50.000	0.0	Fix-Fix	1.0
2	7.900	363.330	12.580	182.000	0.000	0.0	Fix-Fix	1.0
3	11.700	50.000	12.580	0.000	25.000	90.0	Fix-Fix	1.0
4	11.700	50.000	12.580	363.330	25.000	90.0	Fix-Fix	1.0
5	9.240	50.000	12.580	90.750	25.000	90.0	Fix-Fix	1.0
6	9.490	50.000	12.580	181.920	25.000	90.0	Fix-Fix	1.0
7	9.240	50.000	12.580	272.580	25.000	90.0	Fix-Fix	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	8.682	2,682.377	69.309	2,751.686
2	8.682	3,139.374	-69.375	3,139.374
3	-18.062	1,316.416	226.579	1,542.995
4	18.271	1,316.416	229.062	1,545.479
5	-18.062	1,039.631	89.576	1,129.207
6	18.271	1,067.760	0.209	1,067.969
7	18.271	1,039.631	90.507	1,130.138

## Summary

X Distance to Center of Rigidity	181.716 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear	
Y Distance to Center of Rigidity	23.049 ft	Xcm + .05*Max-X - X-cr = 18.271 ft	Torsion = 107010.90 k-ft
		Xcm - .05*Max-X - X-cr = -18.062 ft	Torsion = -105791.48 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear	
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr = 8.682 ft	Torsion = 50,851.33 k-ft
		Ycm - .05*Max-Y - Y-cr = 2.599 ft	Torsion = 15,223.20 k-ft

## Rigid Diaphragm Torsional Analysis

Description QUAD C, BUILDING 357 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

## General Information

Y-Y Axis Shear	0.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	182.00 ft
X-X Axis Shear	2,616.00 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	28.54 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	5.630	363.330	12.580	182.000	50.000	0.0	Fix-Pin	1.0
2	6.770	363.330	12.580	182.000	0.000	0.0	Fix-Pin	1.0
3	10.230	50.000	12.580	0.000	25.000	90.0	Fix-Pin	1.0
4	10.230	50.000	12.580	363.330	25.000	90.0	Fix-Pin	1.0
5	0.500	20.000	12.580	15.670	25.000	90.0	Fix-Pin	1.0
6	0.500	20.000	12.580	35.670	25.000	90.0	Fix-Pin	1.0
7	0.500	20.000	12.580	55.670	25.000	90.0	Fix-Pin	1.0
8	0.500	20.000	12.580	75.670	25.000	90.0	Fix-Pin	1.0
9	0.500	20.000	12.580	90.750	25.000	90.0	Fix-Pin	1.0
10	0.500	20.000	12.580	106.330	25.000	90.0	Fix-Pin	1.0
11	0.500	20.000	12.580	126.330	25.000	90.0	Fix-Pin	1.0
12	0.500	20.000	12.580	146.330	25.000	90.0	Fix-Pin	1.0
13	0.500	20.000	12.580	166.330	25.000	90.0	Fix-Pin	1.0
14	0.500	20.000	12.580	181.920	25.000	90.0	Fix-Pin	1.0
15	0.500	20.000	12.580	197.000	25.000	90.0	Fix-Pin	1.0
16	0.500	20.000	12.580	217.000	25.000	90.0	Fix-Pin	1.0
17	0.500	20.000	12.580	237.000	25.000	90.0	Fix-Pin	1.0
18	0.500	20.000	12.580	257.000	25.000	90.0	Fix-Pin	1.0
19	0.500	20.000	12.580	272.580	25.000	90.0	Fix-Pin	1.0
20	0.500	20.000	12.580	287.660	25.000	90.0	Fix-Pin	1.0
21	0.500	20.000	12.580	307.660	25.000	90.0	Fix-Pin	1.0
22	0.500	20.000	12.580	327.660	25.000	90.0	Fix-Pin	1.0
23	0.500	20.000	12.580	347.660	25.000	90.0	Fix-Pin	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	8.878	1,186.932	37.225	1,224.157
2	8.878	1,427.270	-37.230	1,427.270
3	8.878	0.898	55.740	56.638
4	8.878	0.898	55.738	56.636
5	8.878	0.000	0.693	0.693
6	8.878	0.000	0.610	0.610
7	8.878	0.000	0.526	0.526
8	8.878	0.000	0.443	0.443
9	8.878	0.000	0.380	0.380
10	8.878	0.000	0.315	0.315
11	8.878	0.000	0.231	0.231
12	8.878	0.000	0.148	0.148
13	8.878	0.000	0.064	0.064

Title : QUAD C

Job #

Dsgnr:

Date:

Description : Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d

Scope : Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.

Rev: 506001

## Rigid Diaphragm Torsional Analysis

Page 2

## Description QUAD C, BUILDING 357 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

14	8.878	0.000	0.001	0.001
15	8.878	0.000	0.064	0.064
16	8.878	0.000	0.147	0.148
17	8.878	0.000	0.231	0.231
18	8.878	0.000	0.315	0.315
19	8.878	0.000	0.380	0.380
20	8.878	0.000	0.443	0.443
21	8.878	0.000	0.526	0.526
22	8.878	0.000	0.610	0.610
23	8.878	0.000	0.693	0.693

## Summary

X Distance to Center of Rigidity	181.668 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear		
Y Distance to Center of Rigidity	22.703 ft	Xcm + .05*Max-X - X-cr =	18.498 ft	Torsion = 0.00 k-ft
		Xcm - .05*Max-X - X-cr =	-17.835 ft	Torsion = 0.00 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear		
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr =	8.878 ft	Torsion = 23,225.65 k-ft
		Ycm - .05*Max-Y - Y-cr =	2.795 ft	Torsion = 7,312.52 k-ft

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 02/03/03  
TIME: 11:04 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: GROUND FLOOR FRONT WALL

[illegible]

WALL PORTION: PIER (1-2)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	28.17	0.355	36068	0	36068	NA
SOLID STRIP	FIXED	12.00	4.50	28.17	0.160	83003	0	83003	NA
PIER 1	FIXED	12.00	4.50	18.17	0.248	52868	0	52868	0.821
PIER 2	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.179
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
<b>TOTAL (PIERS ONLY) =</b>								<b>64399</b>	<b>1.000</b>
<b>WALL RIGIDITY =</b>								<b>32046</b>	<b>(K/IN)</b>

WALL PORTION: PIER (3-15)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	123.67	0.081	165086	0	165086	NA
SOLID STRIP	FIXED	12.00	4.50	123.67	0.036	367541	0	367541	NA
PIER 3	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 4	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 5	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 6	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 7	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 8	FIXED	12.00	4.50	2.17	2.074	2544	0	2544	0.018
PIER 9	FIXED	12.00	4.50	5.83	0.772	14293	0	14293	0.099
PIER 10	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 11	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 12	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 13	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 14	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
PIER 15	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.080
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			143679	1.000
					WALL RIGIDITY =			97119	(K/IN)

## WALL PORTION: PIER (17-29)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	125.87	0.080	167768	0	167768	NA
SOLID STRIP	FIXED	12.00	4.50	125.87	0.036	373490	0	373490	NA
PIER 17	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 18	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 19	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 20	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 21	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 22	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 23	FIXED	12.00	4.50	7.83	0.575	20825	0	20825	0.139
PIER 24	FIXED	12.00	4.50	2.17	2.074	2544	0	2544	0.017
PIER 25	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 26	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 27	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 28	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077
PIER 29	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.077

TOTAL (PIERS ONLY) = 150210 1.000  
WALL RIGIDITY = 100599 (K/IN)

## WALL PORTION: PIER (30-31)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	28.17	0.355	36068	0	36068	NA
SOLID STRIP	FIXED	12.00	4.50	28.17	0.160	83003	0	83003	NA
PIER 30	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.179
PIER 31	FIXED	12.00	4.50	18.17	0.248	52868	0	52868	0.821
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

TOTAL (PIERS ONLY) = 64399 1.000  
WALL RIGIDITY = 32046 (K/IN)

## WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.23	12.58	363.33	0.035	264918	0	264918	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

TOTAL (PIERS ONLY) = 0 0.000  
WALL RIGIDITY = 264918 (K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 05/19/03  
TIME: 01:19 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25,  $F_y$  75000 PSI  
MATERIAL STRENGTH\*1.25,  $F'_c$  OR  $F'_m$  = 3750 PSI  
SHEAR DEMAND MODIFIER,  $m = 2$   
FLEXURE DEMAND MODIFIER,  $m = 2$

TOTAL WALL SHEAR = 3503 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: GROUND FLOOR FRONT WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
SOLID WALL	1.00	3503.00	12.00	4353.96	12797.98	44067.7	0.81
PIER (1-2)	0.104	364.2	12.00	335.04	984.81	3641.9	0.87
PIER (3-15)	0.315	1103.7	12.00	1481.04	4353.35	11037.4	0.80
PIER 16	0.151	527.6	12.00	425.04	1249.36	5276.0	1.00
PIER (17-29)	0.326	1143.3	12.00	1505.04	4423.90	11432.8	0.61
PIER (30-31)	0.104	364.2	12.00	335.04	984.81	3641.9	0.87
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

3503.0

WALL PORTION: PIER (1-2)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
PIER 1	0.821	299.0	12.00	215.04	632.09	672.71	0.25
PIER 2	0.179	65.2	12.00	57.00	167.55	146.72	0.21
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

364.2

WALL PORTION: PIER (3-15)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
PIER 3	0.080	88.6	12.00	57.00	167.55	199.31	0.28
PIER 4	0.080	88.6	12.00	57.00	167.55	199.31	0.28
PIER 5	0.080	88.6	12.00	57.00	167.55	199.31	0.28
PIER 6	0.080	88.6	12.00	57.00	167.55	199.31	0.28
PIER 7	0.080	88.6	12.00	57.00	167.55	199.31	0.28
PIER 8	0.018	19.5	12.00	23.04	67.72	43.98	0.15
PIER 9	0.089	109.8	12.00	66.96	196.82	247.05	0.30
PIER 10	0.080	88.6	12.00	57.00	167.55	199.31	0.28
PIER 11	0.080	88.6	12.00	57.00	167.55	199.31	0.28
PIER 12	0.080	88.6	12.00	57.00	167.55	199.31	0.28
PIER 13	0.080	88.6	12.00	57.00	167.55	199.31	0.28
PIER 14	0.080	88.6	12.00	57.00	167.55	199.31	0.28
PIER 15	0.080	88.6	12.00	57.00	167.55	199.31	0.28
	0.000	0.0		0.00	0.00	0.00	0.00

1103.7



WALL PORTION: PIER (17-29)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 17	0.077	87.8	12.00	57.00	167.55	197.47	0.28
PIER 18	0.077	87.8	12.00	57.00	167.55	197.47	0.28
PIER 19	0.077	87.8	12.00	57.00	167.55	197.47	0.28
PIER 20	0.077	87.8	12.00	57.00	167.55	197.47	0.28
PIER 21	0.077	87.8	12.00	57.00	167.55	197.47	0.28
PIER 22	0.077	87.8	12.00	57.00	167.55	197.47	0.28
PIER 23	0.139	158.5	12.00	90.96	287.37	356.63	0.31
PIER 24	0.017	19.4	12.00	23.04	67.72	43.57	0.15
PIER 25	0.077	87.8	12.00	57.00	167.55	197.47	0.28
PIER 26	0.077	87.8	12.00	57.00	167.55	197.47	0.28
PIER 27	0.077	87.8	12.00	57.00	167.55	197.47	0.28
PIER 28	0.077	87.8	12.00	57.00	167.55	197.47	0.28
PIER 29	0.077	87.8	12.00	57.00	167.55	197.47	0.28
	1.000	1143.3					

WALL PORTION: PIER (30-31)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 30	0.179	65.2	12.00	57.00	167.55	146.72	0.21
PIER 31	0.821	299.0	12.00	215.04	632.09	672.71	0.25
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	1.000	384.2					



WALL PORTION: PIER (17-29)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	125.67	0.080	167768	0	167768	NA
SOLID STRIP	FIXED	12.00	6.50	125.87	0.052	258441	0	258441	NA
PIER 17	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 18	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 19	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 20	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 21	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 22	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 23	FIXED	12.00	6.50	7.83	0.830	12934	0	12934	0.153
PIER 24	FIXED	12.00	6.50	2.17	2.995	1062	0	1062	0.013
PIER 25	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 26	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 27	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 28	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076
PIER 29	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.076

TOTAL (PIERS ONLY) = 84599 1.000  
WALL RIGIDITY = 71882 (K/IN)

WALL PORTION: PIER (30-31)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	28.17	0.355	36068	0	36068	NA
SOLID STRIP	FIXED	12.00	6.50	28.17	0.231	56905	0	56905	NA
PIER 30	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.152
PIER 31	FIXED	12.00	6.50	18.17	0.358	35768	0	35768	0.848
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

TOTAL (PIERS ONLY) = 42186 1.000  
WALL RIGIDITY = 29536 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	6.75	12.58	363.33	0.035	217278	0	217278	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

TOTAL (PIERS ONLY) = 0 0.000  
WALL RIGIDITY = 217278 (K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 02/04/03  
TIME: 06:02 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25,  $F_y$  75000 PSI  
MATERIAL STRENGTH\*1.25,  $F'_c$  OR  $F'_m$  = 3750 PSI  
SHEAR DEMAND MODIFIER,  $m$  = 2  
FLEXURE DEMAND MODIFIER,  $m$  = 2

TOTAL WALL SHEAR = 2752 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 2ND FLOOR FRONT WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
SOLID WALL	1.00	2752.00	12.00	4353.96	12797.98	34620.2	0.64
PIER (1-2)	0.120	330.8	12.00	335.04	984.81	3307.8	0.79
PIER (3-15)	0.278	765.5	12.00	1481.04	4353.35	7655.3	0.41
PIER 16	0.189	519.9	12.00	425.04	1249.36	5199.0	0.98
PIER (17-29)	0.293	805.0	12.00	1505.04	4423.90	8050.1	0.43
PIER (30-31)	0.120	330.8	12.00	335.04	984.81	3307.8	0.79
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

2752.0

WALL PORTION: PIER (1-2)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
PIER 1	0.848	280.5	12.00	215.04	632.09	911.47	0.34
PIER 2	0.152	50.3	12.00	57.00	167.55	163.56	0.23
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

330.8

WALL PORTION: PIER (3-15)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
PIER 3	0.080	61.4	12.00	57.00	167.55	199.67	0.28
PIER 4	0.080	61.4	12.00	57.00	167.55	199.67	0.28
PIER 5	0.080	61.4	12.00	57.00	167.55	199.67	0.28
PIER 6	0.080	61.4	12.00	57.00	167.55	199.67	0.28
PIER 7	0.080	61.4	12.00	57.00	167.55	199.67	0.28
PIER 8	0.013	10.2	12.00	23.04	67.72	33.05	0.12
PIER 9	0.104	79.6	12.00	68.96	196.82	258.55	0.31
PIER 10	0.080	61.4	12.00	57.00	167.55	199.67	0.28
PIER 11	0.080	61.4	12.00	57.00	167.55	199.67	0.28
PIER 12	0.080	61.4	12.00	57.00	167.55	199.67	0.28
PIER 13	0.080	61.4	12.00	57.00	167.55	199.67	0.28
PIER 14	0.080	61.4	12.00	57.00	167.55	199.67	0.28
PIER 15	0.080	61.4	12.00	57.00	167.55	199.67	0.28
	0.000	0.0		0.00	0.00	0.00	0.00

765.5

WALL PORTION: PIER (17-29)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 17	0.076	61.1	12.00	57.00	167.55	198.49	0.28
PIER 18	0.076	61.1	12.00	57.00	167.55	198.49	0.28
PIER 19	0.076	61.1	12.00	57.00	167.55	198.49	0.28
PIER 20	0.076	61.1	12.00	57.00	167.55	198.49	0.28
PIER 21	0.076	61.1	12.00	57.00	167.55	198.49	0.28
PIER 22	0.076	61.1	12.00	57.00	167.55	198.49	0.28
PIER 23	0.153	123.1	12.00	90.96	267.37	400.00	0.35
PIER 24	0.013	10.1	12.00	23.04	67.72	32.86	0.11
PIER 25	0.076	61.1	12.00	57.00	167.55	198.49	0.28
PIER 26	0.076	61.1	12.00	57.00	167.55	198.49	0.28
PIER 27	0.076	61.1	12.00	57.00	167.55	198.49	0.28
PIER 28	0.076	61.1	12.00	57.00	167.55	198.49	0.28
PIER 29	0.076	61.1	12.00	57.00	167.55	198.49	0.28
	1.000	805.0					

WALL PORTION: PIER (30-31)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 30	0.152	50.3	12.00	57.00	167.55	163.58	0.23
PIER 31	0.848	280.5	12.00	215.04	632.09	911.47	0.34
	0.000	0.0		0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	1.000	330.8					

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 02/03/03  
TIME: 11:07 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: 3RD FLOOR FRONT WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	10.00	12.58	363.33	0.035	321481	0	321481	NA
SOLID STRIP	CANT	10.00	10.00	363.33	0.028	404677	0	404677	NA
PIER (1-2)	FIXED				0.000	0	24614	24614	0.120
PIER (3-15)	FIXED				0.000	0	56964	56964	0.278
PIER 16	FIXED	10.00	10.00	35.67	0.280	38686	0	38686	0.189
PIER (17-29)					0.000	0	59902	59902	0.293
PIER (30-31)	FIXED				0.000	0	24614	24614	0.120
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			204779	1.000
					WALL RIGIDITY =			181067	(K/IN)

WALL PORTION: PIER (1-2)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	28.17	0.355	30057	0	30057	NA
SOLID STRIP	FIXED	10.00	6.50	28.17	0.231	47421	0	47421	NA
PIER 1	FIXED	10.00	6.50	18.17	0.358	29806	0	29806	0.848
PIER 2	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.152
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			35155	1.000
					WALL RIGIDITY =			24814	(K/IN)

WALL PORTION: PIER (3-15)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	123.87	0.081	137572	0	137572	NA
SOLID STRIP	FIXED	10.00	6.50	123.87	0.053	211934	0	211934	NA
PIER 3	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.080
PIER 4	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.080
PIER 5	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.080
PIER 6	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.080
PIER 7	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.080
PIER 8	FIXED	10.00	6.50	2.17	2.995	885	0	885	0.013
PIER 9	FIXED	10.00	6.50	5.83	1.115	6926	0	6926	0.104
PIER 10	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.080
PIER 11	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.080
PIER 12	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.080
PIER 13	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.080
PIER 14	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.080
PIER 15	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.080
					0.000	0	0	0	0.000
TOTAL (PIERS ONLY) = WALL RIGIDITY =								66647 56964	1.000 (K/IN)



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 02/04/03  
TIME: 06:13 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25,  $F_y$  75000 PSI  
MATERIAL STRENGTH\*1.25,  $F'_c$  OR  $F'_m$  = 3750 PSI SHEAR DEMAND MODIFIER,  $m$  = 2  
FLEXURE DEMAND MODIFIER,  $m$  = 2

TOTAL WALL SHEAR = 1224 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 3RD FLOOR FRONT WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
SOLID WALL	1.00	1224.00	10.00	4353.96	10864.98	15397.9	0.28
PIER (1-2)	0.120	147.1	10.00	335.04	820.68	1471.2	0.35
PIER (3-15)	0.278	340.5	10.00	1481.04	3827.79	3404.8	0.18
PIER 16	0.189	231.2	10.00	425.04	1041.13	2312.3	0.44
PIER (17-29)	0.293	358.0	10.00	1505.04	3686.58	3580.4	0.19
PIER (30-31)	0.120	147.1	10.00	335.04	820.68	1471.2	0.35
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1224.0

WALL PORTION: PIER (1-2)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
PIER 1	0.848	124.7	10.00	215.04	528.74	405.39	0.15
PIER 2	0.152	22.4	10.00	57.00	139.62	72.75	0.10
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

147.1

WALL PORTION: PIER (3-15)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
PIER 3	0.080	27.3	10.00	57.00	139.62	88.81	0.12
PIER 4	0.080	27.3	10.00	57.00	139.62	88.81	0.12
PIER 5	0.080	27.3	10.00	57.00	139.62	88.81	0.12
PIER 6	0.080	27.3	10.00	57.00	139.62	88.81	0.12
PIER 7	0.080	27.3	10.00	57.00	139.62	88.81	0.12
PIER 8	0.013	4.5	10.00	23.04	56.44	14.70	0.05
PIER 9	0.104	35.4	10.00	68.96	164.02	115.00	0.14
PIER 10	0.080	27.3	10.00	57.00	139.62	88.81	0.12
PIER 11	0.080	27.3	10.00	57.00	139.62	88.81	0.12
PIER 12	0.080	27.3	10.00	57.00	139.62	88.81	0.12
PIER 13	0.080	27.3	10.00	57.00	139.62	88.81	0.12
PIER 14	0.080	27.3	10.00	57.00	139.62	88.81	0.12
PIER 15	0.080	27.3	10.00	57.00	139.62	88.81	0.12
	0.000	0.0		0.00	0.00	0.00	0.00

340.5





## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 05/19/03  
TIME: 01:21 PM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	363.33	0.035	450651	0	450651	NA
SOLID STRIP	FIXED	14.00	4.50	363.33	0.012	1260290	0	1260290	NA
PIER 1	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 2	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 3	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 4	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 5	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 6	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 7	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 8	FIXED	14.00	4.50	7.67	0.587	23694	0	23694	0.040
PIER 9	FIXED	14.00	4.50	11.00	0.409	36006	0	36006	0.061
PIER 10	FIXED	14.00	4.50	7.67	0.587	23694	0	23694	0.040
PIER 11	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 12	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 13	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 14	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 15	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 16	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 17	FIXED	14.00	4.50	12.17	0.370	40251	0	40251	0.068
PIER 18	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 19	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 20	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 21	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 22	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 23	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 24	FIXED	14.00	4.50	7.67	0.587	23694	0	23694	0.040
PIER 25	FIXED	14.00	4.50	11.00	0.409	36006	0	36006	0.061
PIER 26	FIXED	14.00	4.50	7.67	0.587	23694	0	23694	0.040
PIER 27	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 28	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 29	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 30	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 31	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 32	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 33	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
					0.000	0			0.000
					0.000	0			0.000

Lremain = 203.37 TOTAL (PIERS ONLY) = 589771 1.000  
THKred = 11.80 WALL RIGIDITY = 320398 (K/IN)

B169

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	9.95	12.58	363.33	0.035	320381	0	320381	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			320381	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 05/19/03  
TIME: 01:21 PM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI  
REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 4128 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION:	GROUND FLOOR BACK WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	4128.00	14.00	4353.96	14930.97	51930.2	0.95
PIER 1	0.032	132.6	14.00	74.04	253.90	298.4	0.32
PIER 2	0.032	132.6	14.00	74.04	253.90	298.4	0.32
PIER 3	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 4	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 5	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 6	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 7	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 8	0.040	165.8	14.00	89.04	305.34	373.1	0.34
PIER 9	0.061	252.0	14.00	129.00	442.38	567.0	0.35
PIER 10	0.040	165.8	14.00	89.04	305.34	373.1	0.34
PIER 11	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 12	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 13	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 14	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 15	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 16	0.032	132.6	14.00	74.04	253.90	298.4	0.32
PIER 17	0.068	281.7	14.00	143.04	490.53	633.9	0.36
PIER 18	0.032	132.6	14.00	74.04	253.90	298.4	0.32
PIER 19	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 20	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 21	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 22	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 23	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 24	0.040	165.8	14.00	89.04	305.34	373.1	0.34
PIER 25	0.061	252.0	14.00	129.00	442.38	567.0	0.35
PIER 26	0.040	165.8	14.00	89.04	305.34	373.1	0.34
PIER 27	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 28	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 29	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 30	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 31	0.023	94.2	14.00	57.00	195.47	211.9	0.30
PIER 32	0.032	132.6	14.00	74.04	253.90	298.4	0.32
PIER 33	0.032	132.6	14.00	74.04	253.90	298.4	0.32
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

4128.0

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 01/30/03  
TIME: 09:22 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	363.33	0.035	450651	0	450651	NA
SOLID STRIP	FIXED	14.00	6.50	363.33	0.018	872456	0	872456	NA
PIER 1	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 2	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 3	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 4	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 5	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 6	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 7	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 8	FIXED	14.00	6.50	7.67	0.847	14660	0	14660	0.042
PIER 9	FIXED	14.00	6.50	11.00	0.591	23488	0	23488	0.067
PIER 10	FIXED	14.00	6.50	7.67	0.847	14660	0	14660	0.042
PIER 11	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 12	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 13	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 14	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 15	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 16	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 17	FIXED	14.00	6.50	12.17	0.534	26525	0	26525	0.076
PIER 18	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 19	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 20	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 21	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 22	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 23	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 24	FIXED	14.00	6.50	7.67	0.847	14660	0	14660	0.042
PIER 25	FIXED	14.00	6.50	11.00	0.591	23488	0	23488	0.067
PIER 26	FIXED	14.00	6.50	7.67	0.847	14660	0	14660	0.042
PIER 27	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 28	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 29	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 30	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 31	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 32	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 33	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
					0.000	0			0.000
					0.000	0			0.000

Lremain = 203.37 TOTAL (PIERS ONLY) = 349619 1.000  
THKred = 10.82 WALL RIGIDITY = 254254 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	7.90	12.58	363.33	0.035	254296	0	254296	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			254296	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 02/04/03  
TIME: 06:24 PM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI  
REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 3139 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION:	2ND FLOOR BACK WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	3139.00	14.00	4353.96	14930.97	39488.6	0.73
PIER 1	0.032	101.3	14.00	74.04	253.90	329.3	0.36
PIER 2	0.032	101.3	14.00	74.04	253.90	329.3	0.36
PIER 3	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 4	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 5	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 6	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 7	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 8	0.042	131.6	14.00	89.04	305.34	427.8	0.39
PIER 9	0.067	210.9	14.00	129.00	442.38	685.4	0.43
PIER 10	0.042	131.6	14.00	89.04	305.34	427.8	0.39
PIER 11	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 12	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 13	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 14	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 15	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 16	0.032	101.3	14.00	74.04	253.90	329.3	0.36
PIER 17	0.076	238.1	14.00	143.04	490.53	774.0	0.43
PIER 18	0.032	101.3	14.00	74.04	253.90	329.3	0.36
PIER 19	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 20	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 21	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 22	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 23	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 24	0.042	131.6	14.00	89.04	305.34	427.8	0.39
PIER 25	0.067	210.9	14.00	129.00	442.38	685.4	0.43
PIER 26	0.042	131.6	14.00	89.04	305.34	427.8	0.39
PIER 27	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 28	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 29	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 30	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 31	0.021	67.2	14.00	57.00	195.47	218.5	0.31
PIER 32	0.032	101.3	14.00	74.04	253.90	329.3	0.36
PIER 33	0.032	101.3	14.00	74.04	253.90	329.3	0.36
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

1.000 3139.0

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 01/30/03  
TIME: 09:23 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	12.00	12.58	363.33	0.035	385777	0	385777	NA
SOLID STRIP	CANT	12.00	6.50	363.33	0.018	747563	0	747563	NA
PIER 1	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 2	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 3	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 4	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 5	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 6	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 7	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 8	FIXED	12.00	6.50	7.67	0.847	12566	0	12566	0.042
PIER 9	FIXED	12.00	6.50	11.00	0.591	20133	0	20133	0.067
PIER 10	FIXED	12.00	6.50	7.67	0.847	12566	0	12566	0.042
PIER 11	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 12	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 13	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 14	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 15	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 16	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 17	FIXED	12.00	6.50	12.17	0.534	22735	0	22735	0.076
PIER 18	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 19	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 20	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 21	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 22	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 23	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 24	FIXED	12.00	6.50	7.67	0.847	12566	0	12566	0.042
PIER 25	FIXED	12.00	6.50	11.00	0.591	20133	0	20133	0.067
PIER 26	FIXED	12.00	6.50	7.67	0.847	12566	0	12566	0.042
PIER 27	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 28	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 29	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 30	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 31	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 32	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 33	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
					0.000	0			0.000
					0.000	0			0.000
		L <sub>remain</sub> =	203.37	TOTAL (PIERS ONLY) =		299674	1.000		
		THK <sub>red</sub> =	9.27	WALL RIGIDITY =		217796	(K/IN)		



WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	6.77	12.58	363.33	0.035	217771	0	217771	NA
SOLID STRIP	CANT	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =		0	0.000	
					WALL RIGIDITY =		217771	(K/IN)	

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 02/04/03  
TIME: 06:16 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1427 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION:	3RD FLOOR BACK WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1427.00	12.00	4353.96	12797.98	17951.7	0.33
PIER 1	0.032	46.1	12.00	74.04	217.63	149.7	0.16
PIER 2	0.032	46.1	12.00	74.04	217.63	149.7	0.16
PIER 3	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 4	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 5	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 6	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 7	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 8	0.042	59.8	12.00	89.04	261.72	194.5	0.18
PIER 9	0.067	95.9	12.00	129.00	379.18	311.6	0.19
PIER 10	0.042	59.8	12.00	89.04	261.72	194.5	0.18
PIER 11	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 12	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 13	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 14	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 15	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 16	0.032	46.1	12.00	74.04	217.63	149.7	0.16
PIER 17	0.076	108.3	12.00	143.04	420.45	351.9	0.20
PIER 18	0.032	46.1	12.00	74.04	217.63	149.7	0.16
PIER 19	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 20	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 21	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 22	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 23	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 24	0.042	59.8	12.00	89.04	261.72	194.5	0.18
PIER 25	0.067	95.9	12.00	129.00	379.18	311.6	0.19
PIER 26	0.042	59.8	12.00	89.04	261.72	194.5	0.18
PIER 27	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 28	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 29	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 30	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 31	0.021	30.6	12.00	57.00	167.55	99.3	0.14
PIER 32	0.032	46.1	12.00	74.04	217.63	149.7	0.16
PIER 33	0.032	46.1	12.00	74.04	217.63	149.7	0.16
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

1.000 1427.0



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 357

DATE: 05/19/03  
 TIME: 01:33 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1853 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: GROUND FLOOR SIDE WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1853.00	16.00	594.00	2328.00	23310.7	3.15
PIER 1	0.142	262.9	16.00	72.96	285.94	591.6	0.65
PIER 2	0.716	1327.2	16.00	324.96	1273.58	2986.1	0.74
PIER 3	0.142	262.9	16.00	72.96	285.94	591.6	0.65
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

1853.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 01/30/03  
TIME: 09:56 AM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR SIDE WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	50.00	0.252	60672	0	60672	NA
SOLID STRIP	FIXED	14.00	6.50	50.00	0.130	119357	0	119357	NA
PIER 1	FIXED	14.00	6.50	6.33	1.027	11043	0	11043	0.128
PIER 2	FIXED	14.00	6.50	27.33	0.238	64335	0	64335	0.744
PIER 3	FIXED	14.00	6.50	6.33	1.027	11043	0	11043	0.128
					0.000	0			0.000
					0.000	0			0.000
					TOTAL (PIERS ONLY) =			86421	1.000
					WALL RIGIDITY =			50825	(K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	11.70	12.58	50.00	0.252	50704	0	50704	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			50704	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 357

DATE: 02/04/03  
 TIME: 05:58 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI  
 SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1545 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 2ND FLOOR SIDE WALL  
 %R V, k

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1545.00	14.00	594.00	2037.00	19436.1	2.63
PIER 1	0.128	197.4	14.00	72.96	250.20	641.6	0.71
PIER 2	0.744	1150.2	14.00	324.96	1114.38	3738.0	0.92
PIER 3	0.128	197.4	14.00	72.96	250.20	641.6	0.71
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

1.000 1545.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 01/29/03  
TIME: 06:22 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F'c OR F'm =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR SIDE WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	12.00	12.58	50.00	0.252	48770	0	48770	NA
SOLID STRIP	CANT	12.00	6.50	50.00	0.130	100497	0	100497	NA
PIER 1	FIXED	12.00	6.50	6.33	1.027	9466	0	9466	0.128
PIER 2	FIXED	12.00	6.50	27.33	0.238	55144	0	55144	0.744
PIER 3	FIXED	12.00	6.50	6.33	1.027	9466	0	9466	0.128
					0.000	0			0.000
					0.000	0			0.000
<b>TOTAL (PIERS ONLY) =</b>								<b>74075</b>	<b>1.000</b>
<b>WALL RIGIDITY =</b>								<b>41573</b>	<b>(K/IN)</b>

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	10.23	12.58	50.00	0.252	41576	0	41576	NA
SOLID STRIP	CANT	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			41576	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 357

DATE: 02/04/03  
 TIME: 06:18 PM

CONCRETE OR MASONRY [C/M] = C  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 56.6 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 3RD FLOOR SIDE WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	56.60	12.00	594.00	1746.00	712.0	0.10
PIER 1	0.128	7.2	12.00	72.96	214.46	23.5	0.03
PIER 2	0.744	42.1	12.00	324.96	955.18	136.9	0.03
PIER 3	0.128	7.2	12.00	72.96	214.46	23.5	0.03
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00
	1.000	56.6					



### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 02/04/03  
TIME: 05:39 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F'c OR F'm =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY WALL w/ DOOR

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	50.00	0.252	60672	0	60672	NA
SOLID STRIP	FIXED	14.00	7.00	50.00	0.140	110726	0	110726	NA
PIER 1	FIXED	14.00	7.00	4.00	1.750	4260	0	4260	0.046
PIER 2	FIXED	14.00	7.00	40.00	0.175	88235	0	88235	0.954
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			92496	1.000
					WALL RIGIDITY =			54758	(K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.64	12.58	50.00	0.252	54778	0	54778	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			54778	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 357

DATE: 05/19/03  
 TIME: 01:32 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1328 KIPS

WALL PORTION:	GROUND FLOOR	HALLWAY	WALL w/ DOOR				
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1328.00	14.00	594.00	2037.00	16706.2	2.26
PIER 1	0.046	61.2	14.00	45.00	154.32	428.2	0.77
PIER 2	0.954	1266.8	14.00	477.00	1635.77	8867.8	1.49
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1328.0



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 357

DATE: 05/19/03  
 TIME: 01:32 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1230 KIPS

WALL PORTION:	GROUND FLOOR HALLWAY WALL w/ DOORS						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1230.00	14.00	594.00	2037.00	15473.4	2.09
PIER 1	0.073	89.3	14.00	51.00	174.89	625.3	1.00
PIER 2	0.855	1051.3	14.00	345.00	1183.10	7359.3	1.71
PIER 3	0.073	89.3	14.00	51.00	174.89	625.3	1.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1230.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 02/04/03  
TIME: 06:08 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR WALL AT DINING AREA

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	50.00	0.252	60672	0	60672	NA
SOLID STRIP	FIXED	14.00	7.00	50.00	0.140	110726	0	110726	NA
PIER 1	FIXED	14.00	7.00	6.00	1.167	9003	0	9003	0.173
PIER 2	FIXED	14.00	7.00	16.33	0.429	34173	0	34173	0.655
PIER 3	FIXED	14.00	7.00	6.00	1.167	9003	0	9003	0.173
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			52180	1.000
					WALL RIGIDITY =			37573	(K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	8.67	12.58	50.00	0.252	37573	0	37573	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			37573	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 357

DATE: 05/19/03  
 TIME: 01:24 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1005 KIPS

WALL PORTION:	GROUND FLOOR WALL AT DINING AREA						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1005.00	14.00	594.00	2037.00	12642.9	1.71
PIER 1	0.173	173.4	14.00	69.00	236.62	1213.8	1.43
PIER 2	0.655	658.2	14.00	192.96	661.71	4607.3	1.93
PIER 3	0.173	173.4	14.00	69.00	236.62	1213.8	1.43
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1005.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 02/04/03  
TIME: 05:56 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: SECOND FLOOR HALLWAY WALL

[illegible]

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	9.24	12.58	50.00	0.252	40043	0	40043	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			40043	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 357

DATE: 02/04/03  
 TIME: 05:56 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1130 KIPS

WALL PORTION:	SECOND FLOOR HALLWAY WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1130.00	10.00	594.00	1455.00	14215.4	1.92
PIER 1	0.500	565.0	10.00	264.96	649.02	3955.0	1.20
PIER 2	0.500	565.0	10.00	264.96	649.02	3955.0	1.20
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1130.0



### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 01/30/03  
TIME: 06:51 AM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F'c OR F'm =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: THIRD FLOOR HALLWAY WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	8.00	12.58	50.00	0.252	32513	0	32513	NA
SOLID STRIP	CANT	8.00	7.00	50.00	0.140	61979	0	61979	NA
PIER 1	FIXED	8.00	7.00	22.33	0.313	27490	0	27490	0.500
PIER 2	FIXED	8.00	7.00	22.33	0.313	27490	0	27490	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			54980	1.000
					WALL RIGIDITY =			30478	(K/IN)

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

DATE: 02/04/03  
TIME: 05:51 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: SECOND FLOOR HALLWAY WALL w/ DOOR

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	12.58	50.00	0.252	43337	0	43337	NA
SOLID STRIP	FIXED	10.00	7.00	50.00	0.140	79090	0	79090	NA
PIER 1	FIXED	10.00	7.00	23.33	0.300	36004	0	36004	0.500
PIER 2	FIXED	10.00	7.00	23.33	0.300	36004	0	36004	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			72008	1.000
					WALL RIGIDITY =			41121	(K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	9.49	12.58	50.00	0.252	41127	0	41127	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			41127	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 357

DATE: 02/04/03  
 TIME: 05:51 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1068 KIPS

WALL PORTION:	SECOND FLOOR HALLWAY WALL w/ DOOR						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1068.00	10.00	594.00	1455.00	13435.4	1.82
PIER 1	0.500	534.0	10.00	276.96	678.41	3738.0	1.08
PIER 2	0.500	534.0	10.00	276.96	678.41	3738.0	1.08
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1068.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

DATE: 01/30/03  
TIME: 06:50 AM

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 357

CONCRETE OR MASONRY [C/M] =  
MATERIAL STRENGTH,  $F'_c$  OR  $F'_m$  =

C  
3000 PSI

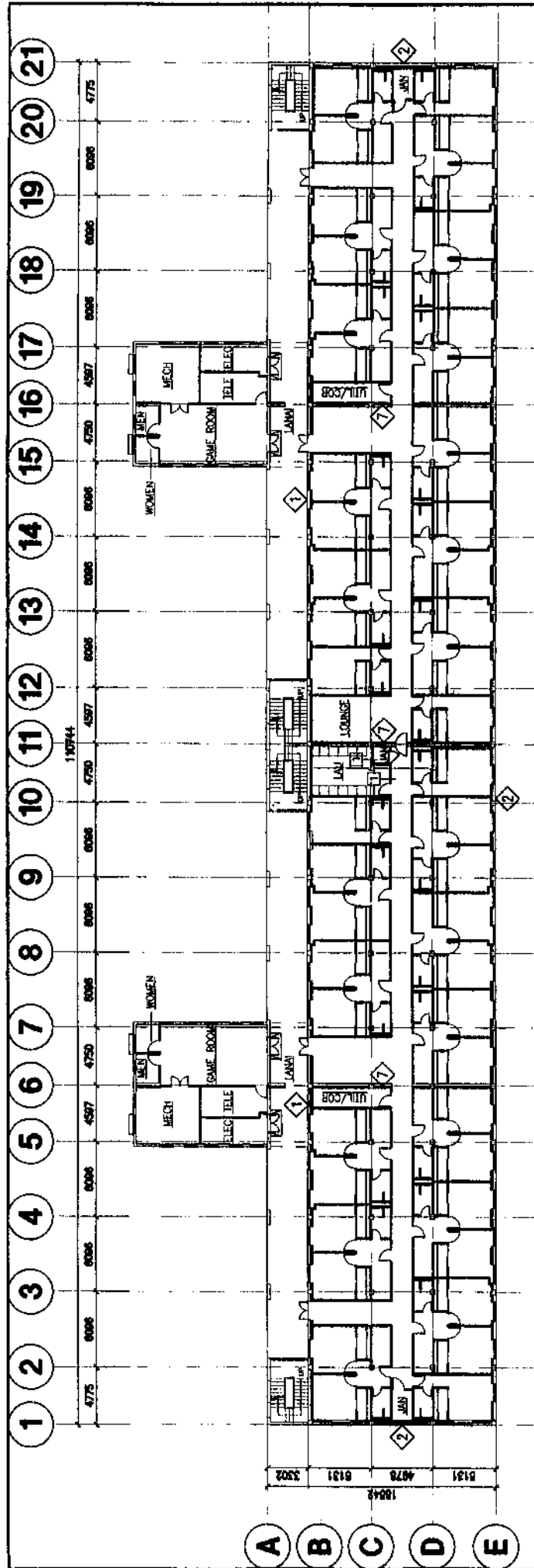
MODULUS OF ELASTICITY =  
SHEAR MODULUS =

3122 KSI  
1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: THIRD FLOOR HALLWAY WALL w/ DOOR

WALL PORTION:		THIRD FLOOR HALLWAY WALL W/ DOOR							
MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	8.00	12.58	50.00	0.252	32513	0	32513	NA
SOLID STRIP	CANT	8.00	7.00	50.00	0.140	61979	0	61979	NA
PIER 1	FIXED	8.00	7.00	23.33	0.300	28803	0	28803	0.500
PIER 2	FIXED	8.00	7.00	23.33	0.300	28803	0	28803	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
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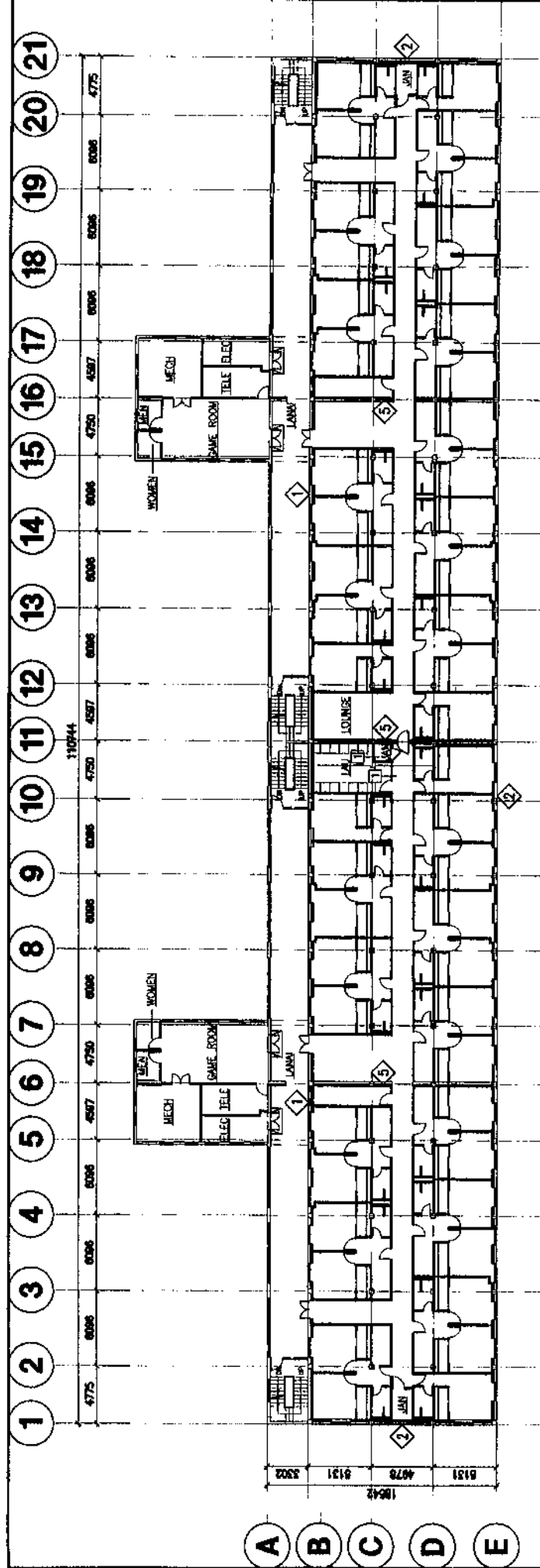
**BUILDING 358 - FIRST FLOOR PLAN**

SHEARWALL RETROFIT SCHEDULE	
DESIGNATION	DESCRIPTION
①	RETROFIT 4" SHOTCRETE WALL
②	RETROFIT 6" SHOTCRETE WALL
③	NEW 15" CONCRETE WALL

**MITSUNAGA & ASSOCIATES  
 747 AMANA STREET, STE. 216  
 HONOLULU, HAWAII 96814**

SEISMIC EVALUATION and REHABILITATION REPORT  
for QUAD "C" WHOLE BARRACKS RENEWAL  
SCHOFIELD BARRACKS, OAHU, HAWAII  
BUILDING 358, FIRST FLOOR PLAN

SCALE: NO SCALE



SHEARWALL RETROFIT SCHEDULE	
DESIGNATION	DESCRIPTION
①	RETROFIT 4" SHOTCRETE WALL
②	RETROFIT 6" SHOTCRETE WALL
③	RETROFIT 8" SHOTCRETE WALL
⑤	NEW 10" CONCRETE WALL



PROJ: QUAD C, BUILDING 358  
TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003  
TIME: 01:13 PM P.M.

$$V = C1 \cdot C2 \cdot C3 \cdot S_a \cdot W$$

$$T = C_t \cdot (h_n)^{3/4}$$

$$S_{xs} = 2/3 \cdot F_a \cdot S_s$$

$$S_{x1} = 2/3 \cdot F_v \cdot S_1$$

$$T_0 = (S_{x1} \cdot B_s / S_{xs} \cdot B_1)$$

SHORT PERIOD SPECTRAL RESPONSE ACCELERATION PARAMETER,  $S_s = 0.60$   
SPECTRAL RESPONSE ACCELERATION PARAMETER AT 1 SEC,  $S_1 = 0.17$

PERFORMANCE LEVEL [IO,SE,LS,CP] =	IO	$B_s =$	1.00
SOIL CLASS [A, B, C, D, E, F] =	E	$B_1 =$	1.00
% DAMPING =	5.000	$T_0 =$	0.62
SITE COEFFICIENT, $F_a =$	1.5	$C_1 =$	1.28
SITE COEFFICIENT, $F_v =$	3.3	$C_2 =$	1.00
$C_t$ FACTOR [0.035,0.030,0.020,0.060] =	0.020	$C_3 =$	1.00

DESIGN SHORT PERIOD RESPONSE ACCELERATION PARAMETER,  $S_{xs} = 0.60$   
DESIGN RESPONSE ACCELERATION PARAMETER AT 1 SEC,  $S_{x1} = 0.37$

RESPONSE SPECTRAL ACCELERATION (AT PERIOD T),  $S_a = 0.60$

TOTAL BUILDING HEIGHT = 41.66 FT  
BUILDING SEISMIC WEIGHT, W = 9826 KIPS

	T (SEC)	k	BASE V (KIPS)
LINEAR STATIC METHOD	0.33	1.00	7554.72

BASE SHEAR COEFFICIENT = 0.7688 x W  
TOTAL DESIGN BASE SHEAR = 7554.7 KIPS

$C_t$	LATERAL SYSTEM	%damping	$B_s$	$B_1$
0.035	Steel Moment Resisting Frames	2.00	0.80	0.80
0.030	RC Moment Resisting Frames	5.00	1.00	1.00
0.030	Eccentrically Braced Frames	10.00	1.20	1.20
0.020	All Other Buildings			
0.060	Wood Buildings			



PROJ: QUAD C, BUILDING 358  
 TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003  
 TIME: 01:13 PM P.M.

CLASS SITE DESCRIPTION - SOIL PROFILES

A HARD ROCK, SHEAR WAVE VELOCITY  $V_s > 5000$  FT/S.  
 B ROCK, SHEAR WAVE VELOCITY  $V_s$  FROM 2500 TO 5000 FT/S.  
 C VERY DENSE SOIL AND SOFT ROCK, SHEAR WAVE VELOCITY  
 $V_s$  FROM 1200 TO 2500 FT/S.  
 D STIFF SOIL, SHEAR WAVE VELOCITY  $V_s$  FROM 600 TO 1200 FT/S.  
 E SOFT SOIL, SHEAR WAVE VELOCITY  $V_s < 600$  FT/S.  
 (ASSUME CLASS E IF NO INFORMATION IS AVAILABLE.)  
 F SOIL REQUIRING SITE-SPECIFIC EVALUATION.

SITE COEFFICIENT,  $F_a$  (Based on Site Class & Spectral Response Acceleration  $S_s$ )

CLASS	SPECTRAL RESPONSE ACCELERATION, $S_s$				
	0.25	0.50	0.75	1.00	1.25
A	0.80	0.80	0.80	0.80	0.80
B	1.00	1.00	1.00	1.00	1.00
C	1.20	1.20	1.10	1.00	1.00
D	1.60	1.40	1.20	1.10	1.00
E	2.50	1.70	1.20	0.90	NA
F	NA	NA	NA	NA	NA

SITE COEFFICIENT,  $F_v$  (Based on Site Class & Spectral Response Acceleration  $S_1$ )

CLASS	SPECTRAL RESPONSE ACCELERATION, $S_1$				
	0.10	0.20	0.30	0.40	0.50
A	0.80	0.80	0.80	0.80	0.80
B	1.00	1.00	1.00	1.00	1.00
C	1.70	1.60	1.50	1.40	1.30
D	2.40	2.00	1.80	1.60	1.50
E	3.50	3.20	2.80	2.40	NA
F	NA	NA	NA	NA	NA

PROJ: QUAD C, BUILDING 358  
 TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003  
 TIME: 01:13 PM P.M.

## INCH-POUND UNITS:

LEVEL	WEIGHT (kips)	DH (ft)	HEIGHT (ft)	W*H/1000 (ft-k)	FORCE (kips)	SHEAR (kips)	V*DH (ft-k)	MOMENT (ft-k)
	0		0.0	0	0.0			0
		0.0				0.0	0	
	0		0.0	0	0.0			0
		0.0				0.0	0	
ROOF	1875		41.7	78	2605.2			0
		16.5				2605.2	42985	
3RD	3846		25.2	97	3227.3			42985
		12.6				5832.4	73372	
2ND	4105		12.6	52	1722.3			116357
		12.6				7554.7	95038	
GRND				0	0.0			211395
	9826	41.7		227	7554.7		211395	

## SEISMIC WEIGHT DETERMINATION

PAGE 1

PROJECT: QUAD C, BUILDING 358 (w/ retrofit) DATE: 02/03/03  
 TITLE: ROOF TIME: 11:38 AM

FLOORS: (ROOF)	DESCRIPTION	WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (kips)
	ROOF	0.018	25054	438.45
		0.000	0	0.00
		0.000	0	0.00
		0.000	0	0.00
				438.45

BEAMS: (ROOF)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	6.50	70.00	0.474	364.00	1.00	172.52
GRID B	8.00	10.00	0.083	364.00	1.00	30.33
GRID C	10.00	10.00	0.104	364.00	1.00	37.92
GRID D	10.00	10.00	0.104	364.00	1.00	37.92
GRID E	6.50	70.00	0.474	364.00	1.00	172.52
TRANS	10.00	10.00	0.104	60.83	19.00	120.39
TRANS-C to D	12.50	12.50	0.183	60.83	19.00	188.11
GRID 1, 21	6.50	70.00	0.474	50.00	2.00	47.40
						807.11

COLUMNS: (ROOF)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	10.00	48.00	0.500	5.58	8.00	22.32
GRID C	16.00	16.00	0.267	5.58	19.00	28.27
GRID D	16.00	16.00	0.267	5.58	19.00	28.27
GRID E	4.00	10.00	0.042	5.58	19.00	4.42
GRID B	4.00	10.00	0.042	5.58	19.00	4.42
	0.00	0.00	0.000	0.00	0.00	0.00
						87.70

WALLS: (ROOF)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (kips)
GRID B	7.82	150.00	0.098	364.00	5.58	198.54
GRID E	9.27	150.00	0.116	364.00	5.58	235.36
GRID A	10.00	150.00	0.125	34.83	5.58	24.29
GRID 1	12.00	150.00	0.150	50.00	5.58	41.85
GRID 21	12.00	150.00	0.150	50.00	5.58	41.85
GRID	0.00	150.00	0.000	50.00	5.58	0.00
GRID	0.00	150.00	0.000	50.00	5.58	0.00
GRID	0.00	150.00	0.000	50.00	5.58	0.00
	0.00	150.00	0.000	0.00	5.58	0.00
						541.89

FLOORS	438.45 kips
BEAMS	807.11 kips
COLUMNS	87.70 kips
WALLS	541.89 kips

1875.15 kips

## SEISMIC WEIGHT DETERMINATION

PAGE 2

PROJECT: QUAD C, BUILDING 358 (w/ retrofit) DATE: 02/03/03  
 TITLE: 3RD FL TIME: 11:38 AM

FLOORS: (3RD FL)	DESCRIPTION	WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (klps)
	TYPICAL FLOOR	0.101	18200	1838.20
	BALCONY	0.078	3942	307.49
	STAIRS (add to balcony)	0.092	253	23.26
	STAIRS (add to balcony)	0.092	217	19.93

2188.87

BEAMS: (3RD FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (klps)
GRID A	6.00	27.00	0.169	364.00	1.00	61.43
GRID C	12.00	14.00	0.175	364.00	1.00	63.70
GRID D	12.00	14.00	0.175	364.00	1.00	63.70
	0.00	0.00	0.000	0.00	0.00	0.00
	0.00	0.00	0.000	0.00	0.00	0.00

188.83

COLUMNS: (3RD FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (klps)
GRID A	10.00	48.00	0.500	5.58	8.00	22.32
GRID C	16.00	16.00	0.267	5.58	19.00	28.27
GRID D	16.00	16.00	0.267	5.58	19.00	28.27
GRID E	4.00	10.00	0.042	5.58	19.00	4.42
GRID B	4.00	10.00	0.042	5.58	19.00	4.42
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	10.00	0.042	6.04	19.00	4.78
GRID B	4.00	10.00	0.042	6.04	19.00	4.78

149.06

WALLS: (3RD FL)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (klps)
GRID B	7.82	150.00	0.098	364.00	5.58	198.54
GRID E	9.27	150.00	0.116	364.00	5.58	235.36
GRID A	10.00	150.00	0.125	34.83	5.58	24.29
GRID 1	12.00	150.00	0.150	50.00	5.58	41.85
GRID 21	12.00	150.00	0.150	50.00	5.58	41.85
	0.00	150.00	0.000	0.00	0.00	0.00
GRID B	9.38	150.00	0.117	364.00	6.04	257.78
GRID E	10.82	150.00	0.135	364.00	6.04	297.36
GRID A	10.00	150.00	0.125	34.83	6.04	26.30
GRID 1	14.00	150.00	0.175	50.00	6.04	52.85
GRID 21	14.00	150.00	0.175	50.00	6.04	52.85
GRID 8	8.00	150.00	0.100	50.00	6.04	30.20
GRID 11	8.00	150.00	0.100	50.00	6.04	30.20
GRID 16	8.00	150.00	0.100	50.00	6.04	30.20
	8.00	150.00	0.100	0.00	0.00	0.00
	8.00	150.00	0.100	0.00	0.00	0.00

1319.62

FLOORS	2188.87 klps
BEAMS	188.83 klps
COLUMNS	149.06 klps
WALLS	1319.62 klps
	3846.38 klps

## SEISMIC WEIGHT DETERMINATION

PAGE 3

PROJECT: QUAD C, BUILDING 358 (w/ retrofit) DATE: 02/03/03  
 TITLE: 2ND FL TIME: 11:38 AM

FLOORS: (2ND FL)	DESCRIPTION	WEIGHT (ksf)	AREA (ft <sup>2</sup> )	TOTAL (kips)
	TYPICAL FLOOR	0.101	18200	1838.20
	BALCONY	0.078	3942	307.49
	STAIRS (add to balcony)	0.092	253	23.26
	STAIRS (add to balcony)	0.092	217	19.93

2188.87

BEAMS: (2ND FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	LENGTH (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	6.00	27.00	0.189	364.00	1.00	61.43
GRID C	12.00	14.00	0.175	364.00	1.00	63.70
GRID D	12.00	14.00	0.175	364.00	1.00	63.70
	0.00	0.00	0.000	0.00	0.00	0.00
	0.00	0.00	0.000	0.00	0.00	0.00

188.83

COLUMNS: (2ND FL)	WIDTH (ins)	DEPTH (ins)	WEIGHT (klf)	HEIGHT (ft)	AMOUNT (ea)	TOTAL (kips)
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	10.00	0.042	6.04	19.00	4.78
GRID B	4.00	10.00	0.042	6.04	19.00	4.78
GRID A	10.00	48.00	0.500	5.17	8.00	20.68
GRID C	12.00	12.00	0.150	5.46	19.00	15.56
GRID D	12.00	12.00	0.150	5.46	19.00	15.56
GRID E	4.00	10.00	0.042	6.04	19.00	4.78
GRID B	4.00	10.00	0.042	6.04	19.00	4.78
	0.00	0.00	0.000	0.00	0.00	0.00

122.73

WALLS: (2ND FL)	THICK (ins)	WEIGHT (pcf)	WEIGHT (ksf)	LENGTH (ft)	HEIGHT (ft)	TOTAL (kips)
GRID B	9.38	150.00	0.117	364.00	6.04	257.78
GRID E	10.82	150.00	0.135	364.00	6.04	297.36
GRID A	10.00	150.00	0.125	34.83	6.04	26.30
GRID 1	14.00	150.00	0.175	50.00	6.04	52.85
GRID 21	14.00	150.00	0.175	50.00	6.04	52.85
GRID 6	8.00	150.00	0.100	50.00	6.04	30.20
GRID 11	8.00	150.00	0.100	50.00	6.04	30.20
GRID 16	8.00	150.00	0.100	50.00	6.04	30.20
	0.00	150.00	0.000	0.00	0.00	0.00
GRID B	10.19	150.00	0.127	364.00	6.04	280.04
GRID E	11.80	150.00	0.148	364.00	6.04	324.29
GRID A	10.00	150.00	0.125	34.83	6.04	26.30
GRID 1	14.00	150.00	0.175	50.00	6.04	52.85
GRID 21	14.00	150.00	0.175	50.00	6.04	52.85
GRID 6	8.00	150.00	0.100	50.00	6.04	30.20
GRID 11	8.00	150.00	0.100	50.00	6.04	30.20
GRID 16	8.00	150.00	0.100	50.00	6.04	30.20
	0.00	150.00	0.000	0.00	0.00	0.00
	0.00	150.00	0.000	0.00	0.00	0.00

1604.66

FLOORS	2188.87 kips
BEAMS	188.83 kips
COLUMNS	122.73 kips
WALLS	1604.66 kips

4105.08 kips

## CENTER OF MASS DETERMINATION

PAGE 1

PROJECT: QUAD C, BUILDING 358 (w/ retrofit)  
 TITLE: ROOF

DATE: 02/03/03  
 TIME: 11:38 AM

FLOORS: (ROOF)	DESCRIPTION	WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	ROOF	438.45	182.00	30.42	79797	13335
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

79797 13335

BEAMS: (ROOF)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	172.52	182.00	60.42	31399	10424
	GRID B	30.33	182.00	49.58	5521	1504
	GRID C	37.92	182.00	33.17	6901	1258
	GRID D	37.92	182.00	16.83	6901	638
	GRID E	172.52	182.00	0.42	31399	72
	TRANS	120.39	182.00	30.42	21911	3662
	TRANS-C to D	188.11	182.00	25.00	34237	4703
	GRID 1, 21	47.40	182.00	30.42	8626	1442

146894 23703

COLUMNS: (ROOF)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	22.32	182.00	60.42	4062	1349
	GRID C	28.27	182.00	33.17	5146	938
	GRID D	28.27	182.00	16.83	5146	476
	GRID E	4.42	182.00	0.87	804	3
	GRID B	4.42	182.00	49.33	804	218
		0.00	0.00	0.00	0	0

15961 2983

WALLS: (ROOF)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID B	198.54	182.00	49.67	38135	9862
	GRID E	235.36	182.00	0.33	42835	78
	GRID A	24.29	182.00	60.50	4421	1470
	GRID 1	41.85	182.00	25.00	7617	1046
	GRID 21	41.85	182.00	25.00	7617	1046
	GRID	0.00	182.00	25.00	0	0
	GRID	0.00	182.00	25.00	0	0
	GRID	0.00	182.00	25.00	0	0
		0.00	0.00	0.00	0	0

WEIGHTX WEIGHTY

98624 13502

FLOORS	79797	13335
BEAMS	146894	23703
COLUMNS	15961	2983
WALLS	98624	13502

CENTER OF MASS X = 182.00  
 CENTER OF MASS Y = 28.54

341277.03 53522.84

## CENTER OF MASS DETERMINATION

PAGE 2

PROJECT: QUAD C, BUILDING 358 (w/ retrofit)  
 TITLE: 3RD FL

DATE: 02/03/03  
 TIME: 11:38 AM

FLOORS: (3RD FL)	DESCRIPTION	WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	TYPICAL FLOOR	1838.20	182.00	25.00	334552	45955
	BALCONY	307.49	182.00	55.42	55962	17039
	STAIRS (add to balcony)	23.26	182.00	55.42	4232	1289
	STAIRS (add to balcony)	19.93	131.67	58.12	2624	1158

397371 65441

BEAMS: (3RD FL)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	61.43	182.00	60.42	11179	3711
	GRID C	63.70	182.00	33.17	11593	2113
	GRID D	63.70	182.00	16.83	11593	1072
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

34366 6896

COLUMNS: (3RD FL)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	22.32	182.00	60.42	4062	1349
	GRID C	28.27	182.00	33.17	5146	938
	GRID D	28.27	182.00	16.83	5146	476
	GRID E	4.42	182.00	0.67	804	3
	GRID B	4.42	182.00	49.33	804	218
	GRID A	20.68	182.00	60.42	3764	1249
	GRID C	15.56	182.00	33.17	2832	516
	GRID D	15.56	182.00	16.83	2832	262
	GRID E	4.78	182.00	0.67	870	3
	GRID B	4.78	182.00	49.33	870	236

27130 5250

WALLS: (3RD FL)		WEIGHT (klps)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID B	198.54	182.00	49.67	36135	9862
	GRID E	235.36	182.00	0.33	42835	78
	GRID A	24.29	182.00	60.50	4421	1470
	GRID 1	41.85	182.00	25.00	7617	1046
	GRID 21	41.85	182.00	25.00	7617	1046
		0.00	0.00	0.00	0	0
	GRID B	257.78	182.00	49.67	46916	12804
	GRID E	297.36	182.00	0.33	54119	98
	GRID A	26.30	182.00	60.50	4786	1591
	GRID 1	52.85	182.00	25.00	9619	1321
	GRID 21	52.85	182.00	25.00	9619	1321
	GRID 6	30.20	182.00	25.00	5496	755
	GRID 11	30.20	182.00	25.00	5496	755
	GRID 16	30.20	182.00	25.00	5496	755
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0

240172 32902

	WEIGHTX	WEIGHTY
FLOORS	397371	65441
BEAMS	34366	6896
COLUMNS	27130	5250
WALLS	240172	32902

699038.57 110489.26

CENTER OF MASS X = 181.74  
 CENTER OF MASS Y = 28.73  
 Total center of mass X = 181.82  
 Total center of mass Y = 28.67

## CENTER OF MASS DETERMINATION

PAGE 3

PROJECT: QUAD C, BUILDING 358 (w/ retrofit)  
 TITLE: 2ND FL

DATE: 02/03/03  
 TIME: 11:38 AM

FLOORS: (2ND FL)	DESCRIPTION	WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	TYPICAL FLOOR	1838.20	182.00	25.00	334552	45955
	BALCONY	307.49	182.00	55.42	55962	17039
	STAIRS (add to balcony)	23.26	182.00	55.42	4232	1289
	STAIRS (add to balcony)	19.93	131.67	58.12	2624	1158
					397371	65441

BEAMS: (2ND FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	61.43	182.00	60.42	11179	3711
	GRID C	63.70	182.00	33.17	11593	2113
	GRID D	63.70	182.00	16.83	11593	1072
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0
					34366	6896

COLUMNS: (2ND FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID A	20.68	182.00	60.42	3764	1249
	GRID C	15.56	182.00	33.17	2832	516
	GRID D	15.56	182.00	16.83	2832	262
	GRID E	4.78	182.00	0.67	870	3
	GRID B	4.78	182.00	49.33	870	236
	GRID A	20.68	182.00	60.42	3764	1249
	GRID C	15.56	182.00	33.17	2832	516
	GRID D	15.56	182.00	16.83	2832	262
	GRID E	4.78	182.00	0.67	870	3
	GRID B	4.78	182.00	49.33	870	236
		0.00	0.00	0.00	0	0
					22337	4533

WALLS: (2ND FL)		WEIGHT (kips)	X (ft)	Y (ft)	WEIGHTX (k-ft)	WEIGHTY (k-ft)
	GRID B	257.78	182.00	49.67	46916	12804
	GRID E	297.38	182.00	0.33	54119	98
	GRID A	26.30	182.00	60.50	4786	1591
	GRID 1	52.85	182.00	25.00	9619	1321
	GRID 21	52.85	182.00	25.00	9619	1321
	GRID 6	30.20	182.00	25.00	5496	755
	GRID 11	30.20	182.00	25.00	5496	755
	GRID 16	30.20	182.00	25.00	5496	755
		0.00	0.00	0.00	0	0
	GRID B	280.04	182.00	49.67	50968	13910
	GRID E	324.29	182.00	0.33	59020	107
	GRID A	26.30	182.00	60.50	4786	1591
	GRID 1	52.85	182.00	25.00	9619	1321
	GRID 21	52.85	182.00	25.00	9619	1321
	GRID 6	30.20	182.00	25.00	5496	755
	GRID 11	30.20	182.00	25.00	5496	755
	GRID 16	30.20	182.00	25.00	5496	755
		0.00	0.00	0.00	0	0
		0.00	0.00	0.00	0	0
					292048	39916

	WEIGHTX	WEIGHTY
FLOORS	397371	65441
BEAMS	34366	6896
COLUMNS	22337	4533
WALLS	292048	39916

CENTER OF MASS X = 181.76  
 CENTER OF MASS Y = 28.45  
 Total center of mass X = 181.80  
 Total center of mass Y = 28.58

746122.02 116786.43



Description : Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d

Scope : Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.

Rev: 506001

## Rigid Diaphragm Torsional Analysis

Page 1

Description QUAD C, BUILDING 358 -- 2ND FLOOR DIAPHRAGM

## General Information

Y-Y Axis Shear	7,555.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	181.80 ft
X-X Axis Shear	7,555.00 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	28.58 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	8.230	363.330	12.580	182.000	50.000	0.0	Fix-Pin	1.0
2	9.950	363.330	12.580	182.000	0.000	0.0	Fix-Fix	1.0
3	12.600	50.000	12.580	0.000	25.000	90.0	Fix-Pin	1.0
4	12.600	50.000	12.580	363.330	25.000	90.0	Fix-Pin	1.0
5	13.860	50.000	12.580	90.750	25.000	90.0	Fix-Pin	1.0
6	14.230	50.000	12.580	181.920	25.000	90.0	Fix-Pin	1.0
7	13.860	50.000	12.580	272.580	25.000	90.0	Fix-Pin	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	8.997	3,408.483	105.828	3,514.311
2	8.997	4,126.438	-105.882	4,126.438
3	-18.090	1,396.267	272.032	1,668.299
4	18.243	1,396.267	274.164	1,670.431
5	-18.090	1,535.894	149.801	1,685.695
6	18.243	1,576.895	0.335	1,577.231
7	18.243	1,535.894	150.879	1,686.772

## Summary

X Distance to Center of Rigidity	181.723 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear	
Y Distance to Center of Rigidity	22.624 ft	Xcm + .05*Max-X - X-cr = 18.243 ft	Torsion = 137827.61 k-ft
		Xcm - .05*Max-X - X-cr = -18.090 ft	Torsion = -136668.21 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear	
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr = 8.997 ft	Torsion = 67,974.31 k-ft
		Ycm - .05*Max-Y - Y-cr = 2.914 ft	Torsion = 22,017.25 k-ft

## Rigid Diaphragm Torsional Analysis

Description QUAD C, BUILDING 358 -- 3RD FLOOR DIAPHRAGM

## General Information

Y-Y Axis Shear	5,832.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	181.82 ft
X-X Axis Shear	5,832.00 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	28.67 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	6.750	363.330	12.580	182.000	50.000	0.0	Fix-Pin	1.0
2	7.900	363.330	12.580	182.000	0.000	0.0	Fix-Fix	1.0
3	11.700	50.000	12.580	0.000	25.000	90.0	Fix-Pin	1.0
4	11.700	50.000	12.580	363.330	25.000	90.0	Fix-Pin	1.0
5	9.240	50.000	12.580	90.750	25.000	90.0	Fix-Pin	1.0
6	9.490	50.000	12.580	181.920	25.000	90.0	Fix-Pin	1.0
7	9.240	50.000	12.580	272.580	25.000	90.0	Fix-Pin	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	8.688	2,681.026	73.532	2,754.558
2	8.688	3,142.066	-73.550	3,142.066
3	-18.062	1,314.920	224.537	1,539.457
4	18.271	1,314.920	227.022	1,541.943
5	-18.062	1,038.450	88.768	1,127.218
6	18.271	1,066.546	0.208	1,066.754
7	18.271	1,038.450	89.701	1,128.151

## Summary

X Distance to Center of Rigidity	181.715 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear	
Y Distance to Center of Rigidity	23.024 ft	Xcm + .05*Max-X - X-cr = 18.271 ft	Torsion = 106559.35 k-ft
		Xcm - .05*Max-X - X-cr = -18.062 ft	Torsion = -105334.71 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear	
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr = 8.688 ft	Torsion = 50,667.47 k-ft
		Ycm - .05*Max-Y - Y-cr = 2.605 ft	Torsion = 15,191.41 k-ft

## Rigid Diaphragm Torsional Analysis

Description QUAD C, BUILDING 358 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

## General Information

Y-Y Axis Shear	0.00 k	Min. X Axis Ecc	5.00 %	X Axis Center of Mass	182.00 ft
X-X Axis Shear	2,605.00 k	Min. Y Axis Ecc	5.00 %	Y Axis Center of Mass	28.54 ft
...Shears are applied on each axis separately				Max X Dimension	363.33 ft
				Max Y Dimension	60.83 ft

## Wall Data

Label	Thickness in	Length ft	Height ft	Wall Xcg ft	Wall Ycg ft	Wall Angle deg CCW	Wall End Fixity	E
1	5.630	363.330	12.580	182.000	50.000	0.0	Fix-Pin	1.0
2	6.770	363.330	12.580	182.000	0.000	0.0	Fix-Pin	1.0
3	10.230	50.000	12.580	0.000	25.000	90.0	Fix-Pin	1.0
4	10.230	50.000	12.580	363.330	25.000	90.0	Fix-Pin	1.0
5	0.500	20.000	12.580	15.670	25.000	90.0	Fix-Pin	1.0
6	0.500	20.000	12.580	35.670	25.000	90.0	Fix-Pin	1.0
7	0.500	20.000	12.580	55.670	25.000	90.0	Fix-Pin	1.0
8	0.500	20.000	12.580	75.670	25.000	90.0	Fix-Pin	1.0
9	0.500	20.000	12.580	90.750	25.000	90.0	Fix-Pin	1.0
10	0.500	20.000	12.580	106.330	25.000	90.0	Fix-Pin	1.0
11	0.500	20.000	12.580	126.330	25.000	90.0	Fix-Pin	1.0
12	0.500	20.000	12.580	146.330	25.000	90.0	Fix-Pin	1.0
13	0.500	20.000	12.580	166.330	25.000	90.0	Fix-Pin	1.0
14	0.500	20.000	12.580	181.920	25.000	90.0	Fix-Pin	1.0
15	0.500	20.000	12.580	197.000	25.000	90.0	Fix-Pin	1.0
16	0.500	20.000	12.580	217.000	25.000	90.0	Fix-Pin	1.0
17	0.500	20.000	12.580	237.000	25.000	90.0	Fix-Pin	1.0
18	0.500	20.000	12.580	257.000	25.000	90.0	Fix-Pin	1.0
19	0.500	20.000	12.580	272.580	25.000	90.0	Fix-Pin	1.0
20	0.500	20.000	12.580	287.660	25.000	90.0	Fix-Pin	1.0
21	0.500	20.000	12.580	307.660	25.000	90.0	Fix-Pin	1.0
22	0.500	20.000	12.580	327.660	25.000	90.0	Fix-Pin	1.0
23	0.500	20.000	12.580	347.660	25.000	90.0	Fix-Pin	1.0

## Calculated Wall Forces

Label	Govern Ecc. for Max Torsion ft	Direct Shear k	Torsional Shear k	Final Max. Wall Shear k
1	8.878	1,181.941	37.069	1,219.010
2	8.878	1,421.269	-37.074	1,421.269
3	8.878	0.895	55.505	56.400
4	8.878	0.895	55.503	56.398
5	8.878	0.000	0.690	0.690
6	8.878	0.000	0.607	0.607
7	8.878	0.000	0.524	0.524
8	8.878	0.000	0.441	0.441
9	8.878	0.000	0.378	0.378
10	8.878	0.000	0.313	0.313
11	8.878	0.000	0.230	0.230
12	8.878	0.000	0.147	0.147
13	8.878	0.000	0.064	0.064

Title : QUAD C

Job #

Desgr:

Date:

Description : Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d

Scope : Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.

Rev: 506001

## Rigid Diaphragm Torsional Analysis

Page 2

## Description QUAD C, BUILDING 358 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

14	8.878	0.000	0.001	0.001
15	8.878	0.000	0.064	0.064
16	8.878	0.000	0.147	0.147
17	8.878	0.000	0.230	0.230
18	8.878	0.000	0.313	0.313
19	8.878	0.000	0.378	0.378
20	8.878	0.000	0.441	0.441
21	8.878	0.000	0.524	0.524
22	8.878	0.000	0.607	0.607
23	8.878	0.000	0.690	0.690

## Summary

X Distance to Center of Rigidity	181.668 ft	Controlling Eccentricities & Forces from Applied Y-Y Shear		
Y Distance to Center of Rigidity	22.703 ft	Xcm + .05*Max-X - X-cr =	18.498 ft	Torsion = 0.00 k-ft
		Xcm - .05*Max-X - X-cr =	-17.835 ft	Torsion = 0.00 k-ft
X Accidental Eccentricity	18.167 ft	Controlling Eccentricities & Forces from Applied X-X Shear		
Y Accidental Eccentricity	3.042 ft	Ycm + .05*Max-Y - Y-cr =	8.878 ft	Torsion = 23,127.99 k-ft
		Ycm - .05*Max-Y - Y-cr =	2.795 ft	Torsion = 7,281.78 k-ft

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 02/03/03  
TIME: 11:15 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: GROUND FLOOR FRONT WALL

[illegible]

WALL PORTION: PIER (1-2)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	12.00	10.00	28.17	0.355	36068	0	36068	NA
SOLID STRIP	FIXED	12.00	4.50	28.17	0.180	83003	0	83003	NA
PIER 1	FIXED	12.00	4.50	18.17	0.248	52868	0	52868	0.821
PIER 2	FIXED	12.00	4.50	5.00	0.900	11531	0	11531	0.179
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
<b>TOTAL (PIERS ONLY) =</b>								<b>64399</b>	<b>1.000</b>
<b>WALL RIGIDITY =</b>								<b>32048</b>	<b>(K/IN)</b>

WALL PORTION: PIER (3-15)

[illegible]





WALL PORTION: PIER (17-29)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 17	0.077	88.0	12.00	57.00	167.55	198.09	0.28
PIER 18	0.077	88.0	12.00	57.00	167.55	198.09	0.28
PIER 19	0.077	88.0	12.00	57.00	167.55	198.09	0.28
PIER 20	0.077	88.0	12.00	57.00	167.55	198.09	0.28
PIER 21	0.077	88.0	12.00	57.00	167.55	198.09	0.28
PIER 22	0.077	88.0	12.00	57.00	167.55	198.09	0.28
PIER 23	0.139	159.0	12.00	90.96	287.37	357.75	0.32
PIER 24	0.017	19.4	12.00	23.04	87.72	43.71	0.15
PIER 25	0.077	88.0	12.00	57.00	167.55	198.09	0.28
PIER 26	0.077	88.0	12.00	57.00	167.55	198.09	0.28
PIER 27	0.077	88.0	12.00	57.00	167.55	198.09	0.28
PIER 28	0.077	88.0	12.00	57.00	167.55	198.09	0.28
PIER 29	0.077	88.0	12.00	57.00	167.55	198.09	0.28
	1.000	1146.9					

WALL PORTION: PIER (30-31)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 30	0.179	65.4	12.00	57.00	167.55	147.19	0.21
PIER 31	0.821	299.9	12.00	215.04	632.09	674.82	0.25
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	1.000	365.3					







## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 02/05/03  
TIME: 06:51 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2755 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 2ND FLOOR FRONT WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	2755.00	12.00	4353.96	12797.98	34657.9	0.64
PIER (1-2)	0.120	331.1	12.00	335.04	984.81	3311.4	0.79
PIER (3-15)	0.278	766.4	12.00	1481.04	4353.35	7663.6	0.41
PIER 16	0.189	520.5	12.00	425.04	1249.36	5204.7	0.98
PIER (17-29)	0.293	805.9	12.00	1505.04	4423.90	8058.9	0.43
PIER (30-31)	0.120	331.1	12.00	335.04	984.81	3311.4	0.79
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

2755.0

WALL PORTION: PIER (1-2)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 1	0.848	280.8	12.00	215.04	632.09	912.47	0.34
PIER 2	0.152	50.4	12.00	57.00	167.55	163.74	0.23
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00

331.1

WALL PORTION: PIER (3-15)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 3	0.080	61.5	12.00	57.00	167.55	199.89	0.28
PIER 4	0.080	61.5	12.00	57.00	167.55	199.89	0.28
PIER 5	0.080	61.5	12.00	57.00	167.55	199.89	0.28
PIER 6	0.080	61.5	12.00	57.00	167.55	199.89	0.28
PIER 7	0.080	61.5	12.00	57.00	167.55	199.89	0.28
PIER 8	0.013	10.2	12.00	23.04	67.72	33.09	0.12
PIER 9	0.104	79.6	12.00	68.96	196.82	258.83	0.31
PIER 10	0.080	61.5	12.00	57.00	167.55	199.89	0.28
PIER 11	0.080	61.5	12.00	57.00	167.55	199.89	0.28
PIER 12	0.080	61.5	12.00	57.00	167.55	199.89	0.28
PIER 13	0.080	61.5	12.00	57.00	167.55	199.89	0.28
PIER 14	0.080	61.5	12.00	57.00	167.55	199.89	0.28
PIER 15	0.080	61.5	12.00	57.00	167.55	199.89	0.28
	0.000	0.0		0.00	0.00	0.00	0.00

766.4

WALL PORTION: PIER (17-29)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 17	0.076	61.1	12.00	57.00	167.55	198.71	0.28
PIER 18	0.076	61.1	12.00	57.00	167.55	198.71	0.28
PIER 19	0.076	61.1	12.00	57.00	167.55	198.71	0.28
PIER 20	0.076	61.1	12.00	57.00	167.55	198.71	0.28
PIER 21	0.076	61.1	12.00	57.00	167.55	198.71	0.28
PIER 22	0.076	61.1	12.00	57.00	167.55	198.71	0.28
PIER 23	0.153	123.2	12.00	90.96	267.37	400.44	0.35
PIER 24	0.013	10.1	12.00	23.04	67.72	32.89	0.11
PIER 25	0.076	61.1	12.00	57.00	167.55	198.71	0.28
PIER 26	0.076	61.1	12.00	57.00	167.55	198.71	0.28
PIER 27	0.076	61.1	12.00	57.00	167.55	198.71	0.28
PIER 28	0.076	61.1	12.00	57.00	167.55	198.71	0.28
PIER 29	0.076	61.1	12.00	57.00	167.55	198.71	0.28
	1.000	805.9					

WALL PORTION: PIER (30-31)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 30	0.152	50.4	12.00	57.00	167.55	163.74	0.23
PIER 31	0.848	280.8	12.00	215.04	632.09	912.47	0.34
	0.000	0.0		0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	1.000	331.1					



## WALL PORTION: PIER (17-29)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	125.67	0.080	139807	0	139807	NA
SOLID STRIP	FIXED	10.00	6.50	125.67	0.052	215368	0	215368	NA
PIER 17	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 18	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 19	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 20	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 21	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 22	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 23	FIXED	10.00	6.50	7.83	0.830	10779	0	10779	0.153
PIER 24	FIXED	10.00	6.50	2.17	2.995	885	0	885	0.013
PIER 25	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 26	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 27	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 28	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076
PIER 29	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.076

TOTAL (PIERS ONLY) = 70489 1.000  
WALL RIGIDITY = 59902 (K/IN)

## WALL PORTION: PIER (30-31)

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	10.00	10.00	28.17	0.355	30057	0	30057	NA
SOLID STRIP	FIXED	10.00	6.50	28.17	0.231	47421	0	47421	NA
PIER 30	FIXED	10.00	6.50	5.00	1.300	5349	0	5349	0.152
PIER 31	FIXED	10.00	6.50	18.17	0.358	29806	0	29806	0.848
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

TOTAL (PIERS ONLY) = 35155 1.000  
WALL RIGIDITY = 24614 (K/IN)

## WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	5.63	12.58	383.33	0.035	180994	0	180994	NA
SOLID STRIP	CANT	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

TOTAL (PIERS ONLY) = 0 0.000  
WALL RIGIDITY = 180994 (K/IN)



WALL PORTION: PIER (17-29)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 17	0.076	27.1	10.00	57.00	139.62	87.92	0.10
PIER 18	0.076	27.1	10.00	57.00	139.62	87.92	0.10
PIER 19	0.076	27.1	10.00	57.00	139.62	87.92	0.10
PIER 20	0.076	27.1	10.00	57.00	139.62	87.92	0.10
PIER 21	0.076	27.1	10.00	57.00	139.62	87.92	0.10
PIER 22	0.076	27.1	10.00	57.00	139.62	87.92	0.10
PIER 23	0.153	54.5	10.00	90.96	222.81	177.18	0.12
PIER 24	0.013	4.5	10.00	23.04	58.44	14.55	0.04
PIER 25	0.076	27.1	10.00	57.00	139.62	87.92	0.10
PIER 26	0.076	27.1	10.00	57.00	139.62	87.92	0.10
PIER 27	0.076	27.1	10.00	57.00	139.62	87.92	0.10
PIER 28	0.076	27.1	10.00	57.00	139.62	87.92	0.10
PIER 29	0.076	27.1	10.00	57.00	139.62	87.92	0.10
	1.000	356.6					

WALL PORTION: PIER (30-31)

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
PIER 30	0.152	22.3	10.00	57.00	139.62	72.45	0.08
PIER 31	0.848	124.2	10.00	215.04	526.74	403.74	0.12
	0.000	0.0		0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	0.000	0.0	0.00	0.00	0.00	0.00	0.00
	1.000	146.5					



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 01/30/03  
TIME: 09:31 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	363.33	0.035	450651	0	450651	NA
SOLID STRIP	FIXED	14.00	4.50	363.33	0.012	1260290	0	1260290	NA
PIER 1	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 2	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 3	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 4	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 5	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 6	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 7	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 8	FIXED	14.00	4.50	7.67	0.587	23694	0	23694	0.040
PIER 9	FIXED	14.00	4.50	11.00	0.409	36006	0	36006	0.061
PIER 10	FIXED	14.00	4.50	7.67	0.587	23694	0	23694	0.040
PIER 11	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 12	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 13	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 14	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 15	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 16	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 17	FIXED	14.00	4.50	12.17	0.370	40251	0	40251	0.068
PIER 18	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 19	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 20	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 21	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 22	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 23	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 24	FIXED	14.00	4.50	7.67	0.587	23694	0	23694	0.040
PIER 25	FIXED	14.00	4.50	11.00	0.409	36006	0	36006	0.061
PIER 26	FIXED	14.00	4.50	7.67	0.587	23694	0	23694	0.040
PIER 27	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 28	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 29	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 30	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 31	FIXED	14.00	4.50	5.00	0.900	13453	0	13453	0.023
PIER 32	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
PIER 33	FIXED	14.00	4.50	6.42	0.701	18946	0	18946	0.032
					0.000	0			0.000
					0.000	0			0.000

L<sub>remain</sub> = 203.37 TOTAL (PIERS ONLY) = 589771 1.000  
THK<sub>red</sub> = 11.80 WALL RIGIDITY = 320398 (K/IN)

3224

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	9.95	12.58	363.33	0.035	320284	0	320284	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			320284	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 02/05/03  
TIME: 06:36 AM

CONCRETE OR MASONRY [C/M] =  
MATERIAL STRENGTH\*1.25, F<sub>c</sub> OR F<sub>m</sub> =

C  
3750 PSI

REINFORCING STRENGTH\*1.25, F<sub>y</sub> 75000 PSI  
SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 4126 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: GROUND FLOOR BACK WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in <sup>2</sup>
SOLID WALL	1.00	4126.00	14.00	4353.96	14930.97	51905.1	0.95
PIER 1	0.032	132.5	14.00	74.04	253.90	298.2	0.32
PIER 2	0.032	132.5	14.00	74.04	253.90	298.2	0.32
PIER 3	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 4	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 5	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 6	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 7	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 8	0.040	165.8	14.00	89.04	305.34	373.0	0.34
PIER 9	0.061	251.9	14.00	129.00	442.38	566.8	0.35
PIER 10	0.040	165.8	14.00	89.04	305.34	373.0	0.34
PIER 11	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 12	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 13	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 14	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 15	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 16	0.032	132.5	14.00	74.04	253.90	298.2	0.32
PIER 17	0.068	281.6	14.00	143.04	490.53	633.6	0.36
PIER 18	0.032	132.5	14.00	74.04	253.90	298.2	0.32
PIER 19	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 20	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 21	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 22	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 23	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 24	0.040	165.8	14.00	89.04	305.34	373.0	0.34
PIER 25	0.061	251.9	14.00	129.00	442.38	566.8	0.35
PIER 26	0.040	165.8	14.00	89.04	305.34	373.0	0.34
PIER 27	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 28	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 29	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 30	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 31	0.023	94.1	14.00	57.00	195.47	211.8	0.30
PIER 32	0.032	132.5	14.00	74.04	253.90	298.2	0.32
PIER 33	0.032	132.5	14.00	74.04	253.90	298.2	0.32
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

4126.0

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 01/30/03  
TIME: 09:32 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	363.33	0.035	450651	0	450651	NA
SOLID STRIP	FIXED	14.00	6.50	363.33	0.018	872456	0	872456	NA
PIER 1	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 2	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 3	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 4	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 5	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 6	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 7	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 8	FIXED	14.00	6.50	7.67	0.847	14660	0	14660	0.042
PIER 9	FIXED	14.00	6.50	11.00	0.591	23488	0	23488	0.067
PIER 10	FIXED	14.00	6.50	7.67	0.847	14660	0	14660	0.042
PIER 11	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 12	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 13	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 14	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 15	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 16	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 17	FIXED	14.00	6.50	12.17	0.534	26525	0	26525	0.076
PIER 18	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 19	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 20	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 21	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 22	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 23	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 24	FIXED	14.00	6.50	7.67	0.847	14660	0	14660	0.042
PIER 25	FIXED	14.00	6.50	11.00	0.591	23488	0	23488	0.067
PIER 26	FIXED	14.00	6.50	7.67	0.847	14660	0	14660	0.042
PIER 27	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 28	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 29	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 30	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 31	FIXED	14.00	6.50	5.00	1.300	7488	0	7488	0.021
PIER 32	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
PIER 33	FIXED	14.00	6.50	6.42	1.012	11286	0	11286	0.032
					0.000	0			0.000
					0.000	0			0.000

L<sub>remain</sub> = 203.37 TOTAL (PIERS ONLY) = 349619 1.000  
THK<sub>red</sub> = 10.82 WALL RIGIDITY = 254254 (K/IN)

B 227

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	7.90	12.58	363.33	0.035	254296	0	254296	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			254296	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 02/05/03  
TIME: 06:47 AM

CONCRETE OR MASONRY [C/M] = C  
MATERIAL STRENGTH\*1.25, F<sub>c</sub> OR F<sub>m</sub> = 3750 PSI  
REINFORCING STRENGTH\*1.25, F<sub>y</sub> = 75000 PSI  
SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 3142 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 2ND FLOOR BACK WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	3142.00	14.00	4353.96	14930.97	39526.4	0.73
PIER 1	0.032	101.4	14.00	74.04	253.90	329.6	0.36
PIER 2	0.032	101.4	14.00	74.04	253.90	329.6	0.36
PIER 3	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 4	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 5	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 6	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 7	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 8	0.042	131.7	14.00	89.04	305.34	428.2	0.39
PIER 9	0.067	211.1	14.00	129.00	442.38	686.0	0.43
PIER 10	0.042	131.7	14.00	89.04	305.34	428.2	0.39
PIER 11	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 12	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 13	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 14	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 15	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 16	0.032	101.4	14.00	74.04	253.90	329.6	0.36
PIER 17	0.076	238.4	14.00	143.04	490.53	774.7	0.43
PIER 18	0.032	101.4	14.00	74.04	253.90	329.6	0.36
PIER 19	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 20	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 21	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 22	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 23	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 24	0.042	131.7	14.00	89.04	305.34	428.2	0.39
PIER 25	0.067	211.1	14.00	129.00	442.38	686.0	0.43
PIER 26	0.042	131.7	14.00	89.04	305.34	428.2	0.39
PIER 27	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 28	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 29	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 30	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 31	0.021	67.3	14.00	57.00	195.47	218.7	0.31
PIER 32	0.032	101.4	14.00	74.04	253.90	329.6	0.36
PIER 33	0.032	101.4	14.00	74.04	253.90	329.6	0.36
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

1.000 3142.0

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 01/30/03  
TIME: 09:32 AM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR BACK WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	12.00	12.58	363.33	0.035	385777	0	385777	NA
SOLID STRIP	CANT	12.00	6.50	363.33	0.018	747563	0	747563	NA
PIER 1	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 2	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 3	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 4	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 5	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 6	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 7	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 8	FIXED	12.00	6.50	7.67	0.847	12566	0	12566	0.042
PIER 9	FIXED	12.00	6.50	11.00	0.591	20133	0	20133	0.067
PIER 10	FIXED	12.00	6.50	7.67	0.847	12566	0	12566	0.042
PIER 11	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 12	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 13	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 14	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 15	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 16	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 17	FIXED	12.00	6.50	12.17	0.534	22735	0	22735	0.076
PIER 18	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 19	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 20	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 21	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 22	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 23	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 24	FIXED	12.00	6.50	7.67	0.847	12566	0	12566	0.042
PIER 25	FIXED	12.00	6.50	11.00	0.591	20133	0	20133	0.067
PIER 26	FIXED	12.00	6.50	7.67	0.847	12566	0	12566	0.042
PIER 27	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 28	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 29	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 30	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 31	FIXED	12.00	6.50	5.00	1.300	6418	0	6418	0.021
PIER 32	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
PIER 33	FIXED	12.00	6.50	6.42	1.012	9674	0	9674	0.032
					0.000	0			0.000
					0.000	0			0.000
		L <sub>remain</sub> =	203.37	TOTAL (PIERS ONLY) =			299674	1.000	
		THK <sub>red</sub> =	9.27	WALL RIGIDITY =			217796	(K/IN)	

WALL PORTION: EQUIVALENT SOLID WALL

B 230

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	6.77	12.58	363.33	0.035	217771	0	217771	NA
SOLID STRIP	CANT	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			217771	(K/IN)



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 02/05/03  
TIME: 06:44 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1421 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: 3RD FLOOR BACK WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1421.00	12.00	4353.96	12797.98	17876.2	0.33
PIER 1	0.032	45.9	12.00	74.04	217.63	149.1	0.16
PIER 2	0.032	45.9	12.00	74.04	217.63	149.1	0.16
PIER 3	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 4	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 5	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 6	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 7	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 8	0.042	59.6	12.00	89.04	261.72	193.6	0.17
PIER 9	0.067	95.5	12.00	129.00	379.18	310.3	0.19
PIER 10	0.042	59.6	12.00	89.04	261.72	193.6	0.17
PIER 11	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 12	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 13	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 14	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 15	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 16	0.032	45.9	12.00	74.04	217.63	149.1	0.16
PIER 17	0.076	107.8	12.00	143.04	420.45	350.4	0.20
PIER 18	0.032	45.9	12.00	74.04	217.63	149.1	0.16
PIER 19	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 20	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 21	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 22	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 23	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 24	0.042	59.6	12.00	89.04	261.72	193.6	0.17
PIER 25	0.067	95.5	12.00	129.00	379.18	310.3	0.19
PIER 26	0.042	59.6	12.00	89.04	261.72	193.6	0.17
PIER 27	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 28	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 29	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 30	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 31	0.021	30.4	12.00	57.00	167.55	98.9	0.14
PIER 32	0.032	45.9	12.00	74.04	217.63	149.1	0.16
PIER 33	0.032	45.9	12.00	74.04	217.63	149.1	0.16
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00
	1.000	1421.0					



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 358

DATE: 02/04/03  
 TIME: 03:56 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1670 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION: GROUND FLOOR SIDE WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1670.00	14.00	594.00	2037.00	21008.6	2.84
PIER 1	0.142	236.9	14.00	72.96	250.20	533.1	0.59
PIER 2	0.716	1196.1	14.00	324.96	1114.38	2691.2	0.66
PIER 3	0.142	236.9	14.00	72.96	250.20	533.1	0.59
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00

1670.0

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 02/04/03  
TIME: 04:17 PM

CONCRETE OR MASONRY [C/M] = C MODULUS OF ELASTICITY = 3122 KSI  
MATERIAL STRENGTH, F<sub>c</sub> OR F<sub>m</sub> = 3000 PSI SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR SIDE WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.00	12.58	50.00	0.252	60672	0	60672	NA
SOLID STRIP	FIXED	14.00	6.50	50.00	0.130	119357	0	119357	NA
PIER 1	FIXED	14.00	6.50	6.33	1.027	11043	0	11043	0.128
PIER 2	FIXED	14.00	6.50	27.33	0.238	64335	0	64335	0.744
PIER 3	FIXED	14.00	6.50	6.33	1.027	11043	0	11043	0.128
					0.000	0			0.000
					0.000	0			0.000

TOTAL (PIERS ONLY) = 86421 1.000  
WALL RIGIDITY = 50825 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	11.70	12.58	50.00	0.252	50704	0	50704	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000

TOTAL (PIERS ONLY) = 0 0.000  
WALL RIGIDITY = 50704 (K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 358

DATE: 02/05/03  
 TIME: 07:01 AM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI  
 SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1542 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION:	2ND FLOOR SIDE WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1542.00	14.00	594.00	2037.00	19398.4	2.62
PIER 1	0.128	197.0	14.00	72.96	250.20	640.4	0.71
PIER 2	0.744	1147.9	14.00	324.96	1114.38	3730.7	0.92
PIER 3	0.128	197.0	14.00	72.96	250.20	640.4	0.71
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00
	1.000	1542.0					

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 01/29/03  
TIME: 06:27 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F'c OR F'm =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR SIDE WALL

[illegible]

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	CANT	10.23	12.58	50.00	0.252	41576	0	41576	NA
SOLID STRIP	CANT	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			41576	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 358

DATE: 02/05/03  
 TIME: 07:03 AM

CONCRETE OR MASONRY [C/M] = C  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 56.4 KIPS

<< Use Grade 60 reinforcing in added shotcrete >>

WALL PORTION:	3RD FLOOR SIDE WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	56.40	12.00	594.00	1746.00	709.5	0.10
PIER 1	0.128	7.2	12.00	72.96	214.46	23.4	0.03
PIER 2	0.744	42.0	12.00	324.96	955.18	136.5	0.03
PIER 3	0.128	7.2	12.00	72.96	214.46	23.4	0.03
	0.000	0.0		0.00	0.00	0.0	0.00
	0.000	0.0		0.00	0.00	0.0	0.00
	1.000	56.4					

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 02/04/03  
TIME: 03:59 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F'c OR F'm =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	15.00	12.58	50.00	0.252	65005	0	65005	NA
SOLID STRIP	FIXED	15.00	7.00	50.00	0.140	118635	0	118635	NA
PIER 1	FIXED	15.00	7.00	22.33	0.313	51544	0	51544	0.500
PIER 2	FIXED	15.00	7.00	22.33	0.313	51544	0	51544	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			103088	1.000
					WALL RIGIDITY =			80044	(K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	13.86	12.58	50.00	0.252	60065	0	60065	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			60065	(K/IN)



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 358

DATE: 02/04/03  
 TIME: 03:59 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI  
 SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1687 KIPS

WALL PORTION:	GROUND FLOOR HALLWAY WALL						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1687.00	15.00	594.00	2182.50	21222.5	2.87
PIER 1	0.500	843.5	15.00	264.96	973.53	5904.5	1.79
PIER 2	0.500	843.5	15.00	264.96	973.53	5904.5	1.79
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1687.0



## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 358

DATE: 02/04/03  
 TIME: 04:20 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1128 KIPS

WALL PORTION: SECOND FLOOR HALLWAY WALL

	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1128.00	10.00	594.00	1455.00	14190.2	1.92
PIER 1	0.500	564.0	10.00	264.96	649.02	3948.0	1.20
PIER 2	0.500	564.0	10.00	264.96	649.02	3948.0	1.20
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1128.0



### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 02/04/03  
TIME: 04:01 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F <sub>c</sub> OR F <sub>m</sub> =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY WALL w/ DOOR

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	15.00	12.58	50.00	0.252	65005	0	65005	NA
SOLID STRIP	FIXED	15.00	7.00	50.00	0.140	118635	0	118635	NA
PIER 1	FIXED	15.00	7.00	23.33	0.300	54006	0	54006	0.500
PIER 2	FIXED	15.00	7.00	23.33	0.300	54006	0	54006	0.500
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			108012	1.000
					WALL RIGIDITY =			81681	(K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	14.23	12.58	50.00	0.252	61668	0	61668	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			61668	(K/IN)

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 02/04/03  
TIME: 04:01 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1577 KIPS

WALL PORTION:	GROUND FLOOR HALLWAY WALL w/ DOOR						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1577.00	15.00	594.00	2182.50	19838.7	2.68
PIER 1	0.500	788.5	15.00	276.96	1017.62	5519.5	1.60
PIER 2	0.500	788.5	15.00	276.96	1017.62	5519.5	1.60
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1577.0

### RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
DESCRIPTION: BLDG 358

DATE: 02/04/03  
TIME: 04:21 PM

CONCRETE OR MASONRY [C/M] =	C	MODULUS OF ELASTICITY =	3122 KSI
MATERIAL STRENGTH, F'c OR F'm =	3000 PSI	SHEAR MODULUS =	1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: SECOND FLOOR HALLWAY WALL w/ DOOR

[illegible]

WALL PORTION: EQUIVALENT SOLID WALL

MARK	[CANT/ FIXED]	THK (IN)	H (FT)	L (FT)	H/L	CALC R (K/IN)	PROV R (K/IN)	USE R (K/IN)	%R
SOLID WALL	FIXED	9.49	12.58	50.00	0.252	41127	0	41127	NA
SOLID STRIP	FIXED	0.00	0.00	0.00	0.000	0	0	0	NA
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					0.000	0	0	0	0.000
					TOTAL (PIERS ONLY) =			0	0.000
					WALL RIGIDITY =			41127	(K/IN)

## RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C  
 DESCRIPTION: BLDG 358

DATE: 02/04/03  
 TIME: 04:21 PM

CONCRETE OR MASONRY [C/M] = C REINFORCING STRENGTH\*1.25, Fy 75000 PSI  
 MATERIAL STRENGTH\*1.25, F'c OR F'm = 3750 PSI SHEAR DEMAND MODIFIER, m = 2  
 FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1067 KIPS

WALL PORTION:	SECOND FLOOR HALLWAY WALL w/ DOOR						
	%R	V, k	b, in	d, in	allow V, k	M, ft-k	AsREQD, in2
SOLID WALL	1.00	1067.00	10.00	594.00	1455.00	13422.9	1.81
PIER 1	0.500	533.5	10.00	276.96	678.41	3734.5	1.08
PIER 2	0.500	533.5	10.00	276.96	678.41	3734.5	1.08
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0	0.00	0.00	0.00	0.0	0.00
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					
	0.000	0.0					

1067.0





## ATTACHMENT 13

### SUSTAINABLE DESIGN SpiRiT CHECKLIST

# **Sustainable Project Rating Tool (SPiRiT)**

**Version 1.4.1**

**U. S. Army Corps of Engineers  
U. S. Army Assistant Chief of Staff for Installation Management**

**June 2002**

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## NOTES

- 1) This Sustainable Project Rating Tool (SPIRiT) is derived from The U. S. Green Building Council LEED 2.0 (Leadership in Energy and Environmental Design) Green Building Rating System™.
- 2) The SPIRiT numbering scheme parallels, but does not match LEED 2.0. LEED does not number major sections, which it calls 'Credit Categories,' ex. 'Sustainable Sites,' rather it numbers criteria or 'credits' within each major section. SPIRiT credit numbers match those of LEED where there is a 1:1 comparison. Where additional credits have been added they fall at the end of major sections.
- 3) The SPIRiT Credits all follow the format: Intent, Requirement and Technologies/Strategies.

Intent: A statement of the primary goal for the credit;

Requirement: Quantifiable conditions necessary to achieve stated Intent;

Technologies/Strategies: Suggested technologies, strategies and referenced guidance on the means to achieve identified requirements.

- 4) Projects are evaluated for each SPIRiT credit which are either 'Prerequisites' or result in a point score:

Prerequisites: These credits are a statement of minimum requirements and must be met. No further points will be awarded unless the minimum is achieved. These credits are recognizable by an 'R' in the number scheme, ex. 1.R1, and a 'Reqd.' in the score column.

Point Score: These credits are evaluated and result in a point score. Where the potential score is greater than 1, no partial points are granted.

- 5) SPIRiT Sustainable Project Certification Levels:

SPIRiT Bronze	25 to 34 Points
SPIRiT Silver	35 to 49 Points
SPIRiT Gold	50 to 74 Points
SPIRiT Platinum	75 to 100 Points

- 6) SPIRiT credits have been developed to address facility life cycle phases including programming, design, construction, and commissioning. Additional rating tools will be developed to address installation/base master planning and facilities operations and maintenance, rehabilitation, recycling, and disposal.

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- 9) Army/USACE employees are members of the USGBC with membership privileges accessible via the USGBC web site, <http://www.usgbc.org>. For information on membership and access to available LEED resources to support use of SPIRiT and sustainable design in your projects, contact Richard Schneider at (217) 373-6752 or [richard.l.schneider@erdc.usace.army.mil](mailto:richard.l.schneider@erdc.usace.army.mil) (Annette Stumpf at (217) 352-6511 ext. 7542 or [annette.l.stumpf@erdc.usace.army.mil](mailto:annette.l.stumpf@erdc.usace.army.mil) alternate).

- 10) For the latest information on SPIRiT and for access to guidance, tools and resources supporting sustainable design initiatives, visit the CERL 'Sustainable Design and Development Resource' website, <http://www.cerl.army.mil/SustDesign>. There you may also join the CERL Sustainable Design ListServ to be directly notified of information pertinent to sustainable design.

**1.R1 Erosion, Sedimentation, and Water Quality Control <sup>(1)</sup>**

Reqd.

Intent: Control erosion and pollutants to reduce negative impacts on water and air quality.

- Requirement: ☐ Design a site sediment and erosion control plan and a pollution prevention plan that conforms to best management practices in the EPA's Storm Water Management for Construction Activities, EPA Document No. EPA-833-R-92-001, Chapter 3, OR local Erosion and Sedimentation Control standards and codes, whichever is more stringent. The plan shall meet the following objectives:
- Prevent loss of soil during construction by storm water runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.
  - Prevent sedimentation of storm sewer or receiving streams and/or air pollution with dust and particulate matter.
  - Prevent hazardous material discharge into storm water systems.
  - Prevent petroleum oils and lubricants (POL) discharge into storm water systems.

Technologies /Strategies: The EPA standard lists numerous measures such as silt fencing, sediment traps, oil grit separators, construction phasing, stabilization of steep slopes, maintaining vegetated ground cover and providing ground cover that will meet this prerequisite.

**1.C1 Site Selection <sup>(1)</sup>**

Intent: Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site. Select site based on functional adjacencies/relationships and land use compatibility.

- Requirement: ☐ Do not develop buildings on portions of sites that meet any one of the following criteria: 1
- Prime training or maneuver land.
  - Land whose elevation is lower than 5 ft. above the 100-year flood elevation as defined by FEMA.
  - Land that provides habitat for any species on the Federal or State threatened or endangered list.
  - Within 100 feet of any wetland as defined by 40 CFR, Parts 230-233 and Part 22, OR as defined by local or state rule or law, whichever is more stringent.
- ☐ Select site based on functional adjacencies/relationships and land use compatibility. 1
- Select sites close to existing roads and utilities or use an existing structure to minimize the need for new infrastructure.
  - Select site in area of high density.
  - Site facilities based on the strength of their relationships to other facilities/land-uses to limit travel distances. The stronger the relationship/functional interaction, the closer the distance between two facilities.
  - Select for distance to installation/base transit systems and access to pedestrian ways and bike paths.
  - Select for development previously used or developed suitable and available sites.

Technologies /Strategies: Screen potential building sites for these criteria and/or ensure that these criteria are addressed by the designer during the conceptual design phase. Utilize landscape architects, ecologists, environmental engineers, civil engineers, and similar professionals for the screening process. New wetlands constructed as part of stormwater mitigation or other site restoration efforts are not affected by the restrictions of this prerequisite.

<sup>(1)</sup> Adapted material not reviewed or endorsed by U. S. Green Building Council.

## 1.0 Sustainable Sites (Continued)

### 1.C2 Installation/Base Redevelopment <sup>(1)</sup>

Intent: Channel development to Installation/base cantonment areas with existing infrastructure; protecting greenfields and preserving habitat and natural resources.

- |              |   |   |
|--------------|---|---|
| Requirement: | <input type="checkbox"/> Increase localized density to conform to existing or desired density goals by utilizing sites that are located within existing cantonment areas of high development density. | 1 |
|              | <input type="checkbox"/> Select sites close to existing roads and utilities or use an existing structure to minimize the need for new infrastructure.   | 1 |

Technologies /Strategies: During the site selection process give preference to previously developed sites with installation/base cantonment redevelopment potential such as facility reduction program cleared sites.

### 1.C3 Brownfield Redevelopment <sup>(1)</sup>

Intent: Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.

- |              |   |   |
|--------------|---|---|
| Requirement: | <input type="checkbox"/> Develop on a site classified as a brownfield and provide remediation as required by EPA's Brownfield Redevelopment program requirements OR Develop a brownfield site (a site that has been contaminated by previous uses). | 1 |
|--------------|---|---|

Technologies /Strategies: Screen potential damaged sites for these criteria prior to selection for rehabilitation.

Utilize EPA OSWER Directive 9610.17 and ASTM Standard Practice E1739 for site remediation where required.

### 1.C4 Alternative Transportation <sup>(1)</sup>

Intent: Reduce pollution and land development impacts from automobile use.

- |              |   |   |
|--------------|---|---|
| Requirement: | <input type="checkbox"/> Locate building within ½ mile of installation/base transit systems.  | 1 |
|              | <input type="checkbox"/> Provide suitable means for securing bicycles, with convenient changing/shower facilities for use by cyclists, for 5% or more of building occupants.  | 1 |
|              | <input type="checkbox"/> Locate building within 2 miles of alternative-fuel refueling station(s).   | 1 |
|              | <input type="checkbox"/> Size parking capacity not to exceed minimum installation/base cantonment requirements AND provide preferred parking for carpools or van pools capable of serving 5% of the building occupants, OR, add no new parking for rehabilitation projects AND provide preferred parking for carpools or van pools capable of serving 5% of the building occupants. | 1 |

Technologies /Strategies: Select sites near public installation/base transit served by safe, convenient pedestrian pathways.

<sup>(1)</sup> Adapted material not reviewed or endorsed by U. S. Green Building Council.



## 1.0 Sustainable Sites (Continued)

### 1.C5 Reduced Site Disturbance <sup>(1)</sup>

Intent: Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.

- Requirement:
- ☐ On greenfield sites, limit site disturbance including earthwork and clearing of vegetation to 40 feet beyond the building perimeter, 5 feet beyond primary roadway curbs, walkways, and main utility branch trenches, and 25 feet beyond pervious paving areas that require additional staging areas in order to limit compaction in the paved area; OR, on previously developed sites, restore a minimum of 50% of the remaining open area by planting native or adapted vegetation. 1
  - ☐ Reduce the development footprint (including building, access roads and parking) to exceed the installation/base's/master plan local zoning's open space requirement for the site by 25% or in accordance with installation/base policy on open space set asides, whichever is greater. 1

Technologies /Strategies: Note requirements on plans and in specifications. Establish contractual penalties for destruction of trees and site areas noted for protection. Reduce footprints by tightening program needs and stacking floor plans. Establish clearly marked construction and disturbance boundaries. Delineate laydown, recycling, and disposal areas. Use areas to be paved as staging areas. Work with local horticultural extension services, native plant societies, or installation/base agronomy staff to select indigenous plant species for site restoration and landscaping.

### 1.C6 Stormwater Management <sup>(1)</sup>

Intent: Limit disruption of natural water flows by minimizing storm water runoff, increasing on-site infiltration and reducing contaminants.

- Requirement: Implement a stormwater management plan that results in:
- ☐ No net increase in the rate or quantity of stormwater runoff from undeveloped to developed conditions; OR, if existing imperviousness is greater than 50%, implement a stormwater management plan that results in a 25% decrease in the rate and quantity of stormwater runoff. 1
  - ☐ Treatment systems designed to remove 80% of the average annual post development total suspended solids (TSS), and 40% of the average annual post development total phosphorous (TP), by implementing Best Management Practices (BMPs) outlined in EPA's Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (EPA-840-B-92-002 1/93). 1

Technologies /Strategies: Significantly reduce impervious surfaces, maximize on-site stormwater infiltration, and retain pervious and vegetated areas. Capture rainwater from impervious areas of the building for groundwater recharge or reuse within building. Use green/vegetated roofs. Utilize biologically-based and innovative stormwater management features for pollutant load reduction such as constructed wetlands, stormwater filtering systems, bioswales, bio-retention basins, and vegetated filter strips. Use open vegetated swales to reduce drainage velocity and erosion, reduce system maintenance, increase vegetative variety and support wildlife habitat where space permits.

### 1.C7 Landscape and Exterior Design to Reduce Heat Islands <sup>(2)</sup>

Intent: Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.

- Requirement:
- ☐ Provide shade (within 5 years) on at least 30% of non-roof impervious surface on the site, including parking lots, walkways, plazas, etc., OR, use light-colored/ high-albedo materials (reflectance of at least 0.3) for 30% of the site's non-roof impervious surfaces, OR place a minimum of 50% of parking space under-ground OR use open-grid pavement system (net impervious area of LESS than 50%) for a minimum of 50% of the parking lot area. 1
  - ☐ Use ENERGY STAR Roof compliant, high-reflectance AND low emissivity roofing (initial reflectance of at least .65 and three-year-aged reflectance of at least .5 when tested in accordance with ASTM E408) for a minimum of 75% of the roof surface; OR, install a "green" (vegetated) roof for at least 50% of the roof area. 1

Technologies /Strategies: Employ design strategies, materials, and landscaping designs that reduce heat absorption of exterior materials. Note albedo/reflectance requirements in the drawings and specifications. Provide shade (calculated on June 21, noon solar time) using native or climate tolerant trees and large shrubs, vegetated trellises, or other exterior structures supporting vegetation. Substitute vegetated surfaces for hard surfaces. Explore elimination of blacktop and the use of new coatings and integral colorants for asphalt to achieve light colored surfaces.

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## 1.0 Sustainable Sites (Continued)

### 1.C8 Light Pollution Reduction <sup>(1)</sup>

Intent: Eliminate light trespass from the building site, improve night sky access, and reduce development impact on nocturnal environments.

Requirement: ☐ Do not exceed Illuminating Engineering Society of North America (IESNA) footcandle level requirements as stated in the Recommended Practice Manual: Lighting for Exterior Environments, AND design interior and exterior lighting such that zero direct-beam illumination leaves the building site. 1

Technologies /Strategies: Consult IESNA Recommended Practice Manual: Lighting for Exterior Environments for Commission Internationale de l'Eclairage (CIE) zone and pre and post curfew hour descriptions and associated ambient lighting level requirements. Ambient lighting for pre-curfew hours for CIE zones range between .01 footcandles for areas with dark landscapes such as parks, rural, and residential areas, and 1.5 footcandles for areas with high ambient brightness such as installation/base areas with high levels of nighttime activity. Design site lighting and select lighting styles and technologies to have a minimal impact off-site and minimal contribution to sky glow. Minimize lighting of architectural and landscape features. Exterior lighting should be consistent with security lighting requirements.

### 1.C9 Optimize Site Features

Intent: Optimize utilization of the site's existing natural features and placement of man-made features on the site.

Requirement: ☐ Perform both of the following: 1

- Maximize the use of free site energy.
- Plan facility, parking and roadways to "fit" existing site contours and limit cut and fill.

Technologies /Strategies: Evaluate site resources to ascertain how each can enhance the proposed project and visa versa. Work to maximum advantage of the site's solar and wind attributes. Use landscaping to optimize solar and wind conditions and to contribute to energy efficiency; Locate and orient the facility on the site to optimize solar and wind conditions.

### 1.C10 Facility Impact

Intent: Minimize negative impacts on the site and on neighboring properties and structures; avoid or mitigate excessive noise, shading on green spaces, additional traffic, obscuring significant views, etc.

Requirement: ☐ Cluster facilities to reduce impact, access distance to utilities and sufficient occupant density to support mass transit. 1

☐ Collaborate with installation/base and community planners to identify and mitigate potential impacts of the project beyond site boundaries, and transportation planners to insure efficient public transport. 1

Technologies /Strategies: Involve local/regional planners and community members in installation/base master planning processes. Recognize the context and the impact of a project beyond site boundaries, and integrate it with the larger installation/base/community context/land use.

### 1.C11 Site Ecology

Intent: Identify and mitigate all existing site problems including contamination of soil, water, and air, as well as any negative impacts caused by noise, eyesores, or lack of vegetation, enhancing or creating new site habitat.

Requirement: ☐ Develop site environmental management and mitigation plan. 1

Technologies /Strategies: Understand site and surrounding ecosystem interdependence and interconnectivity. Plan landscaping scheme to incorporate biodiversity. Preserve/enhance existing trees, hydrological features, ecosystems, habitats, and cultural resources. Increase the existence of healthy habitat for native species. Reintroduce native plants and trees where they have been destroyed by previous development.

<sup>(1)</sup> Adapted material not reviewed or endorsed by U. S. Green Building Council.

<b>2.0</b>	<b>Water Efficiency</b>	<b>Score</b>	<b>5</b>
------------	-------------------------	--------------	----------

**2.C1**      **Water Efficient Landscaping** <sup>(2)</sup>

Intent: Limit or eliminate the use of potable water for landscape irrigation.

- |              |  |   |
|--------------|--|---|
| Requirement: | <input type="checkbox"/> Use high efficiency irrigation technology, OR, use captured rain or recycled site water to reduce potable water consumption for irrigation by 50% over conventional means.                                  | 1 |
|              | <input type="checkbox"/> Use only captured rain or recycled site water for an additional 50% reduction (100% total reduction) of potable water for site irrigation needs, OR, do not install permanent landscape irrigation systems. | 1 |

Technologies /Strategies: Develop a landscaping water use baseline according to the methodology outlined in the LEED Reference Guide. Specify water-efficient, native or adapted, climate tolerant plantings. High efficiency irrigation technologies include micro irrigation, moisture sensors, or weather data based controllers. Feed irrigation systems with captured rainwater, gray water, or on-site treated wastewater.

**2.C2**      **Innovative Wastewater Technologies** <sup>(2)</sup>

Intent: Reduce generation of wastewater and potable water demand, while increasing local aquifer recharge.

- |              |   |   |
|--------------|---|---|
| Requirement: | <input type="checkbox"/> Reduce the use of municipally provided potable water for building sewage conveyance by a minimum of 50%, OR, treat 100% of wastewater on site to tertiary standards. | 1 |
|--------------|---|---|

Technologies /Strategies: Develop a wastewater baseline according to the methodology outlined in the LEED Reference Guide. Implement decentralized on-site wastewater treatment and reuse systems. Decrease the use of potable water for sewage conveyance by utilizing gray and/or black water systems. Non-potable reuse opportunities include, toilet flushing, landscape irrigation, etc. Provide advanced wastewater treatment after use by employing innovative, ecological, on-site technologies including constructed wetlands, a mechanical recirculating sand filter, or aerobic treatment systems.

**2.C3**      **Water Use Reduction** <sup>(1)</sup>

Intent: Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

- |              |  |   |
|--------------|--|---|
| Requirement: | <input type="checkbox"/> Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building (not including irrigation) after meeting Energy Policy Act (EPACT) of 1992 fixture performance requirements. | 1 |
|              | <input type="checkbox"/> Exceed the potable water use reduction by an additional 10% (30% total efficiency increase).  | 1 |

Technologies /Strategies: Develop a water use baseline including all water consuming fixtures, equipment, and seasonal conditions according to methodology guidance outlined in the LEED Reference Guide. Specify water conserving plumbing fixtures that exceed Energy Policy Act (EPACT) of 1992 fixture requirements in combination with ultra high efficiency or dry fixture and control technologies. Specify high water efficiency equipment (dishwashers, laundry, cooling towers, etc.). Use alternatives to potable water for sewage transport water. Use recycled or storm water for HVAC/process make up water. Install cooling tower systems designed to minimize water consumption from drift, evaporation and blowdown.

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**3.R1 Fundamental Building Systems Commissioning <sup>(1)</sup>****Reqd.**

**Intent:** Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.

**Requirement:** ☐ Implement all of the following fundamental best practice commissioning procedures.

- Engage a commissioning authority.
- Develop design intent and basis of design documentation.
- Include commissioning requirements in the construction documents.
- Develop and utilize a commissioning plan.
- Verify installation, functional performance, training and documentation.
- Complete a commissioning report.

**Technologies /Strategies:** Introduce standards and strategies into the design process early, and then carry through selected measures by clearly stating target requirements in the construction documents. Tie contractor final payments to documented system performance. Perform additional commissioning in accordance with the DOE Building Commissioning Guide, Version 2.2. Refer to the LEED Reference Guide for detailed descriptions of required elements and references to additional commissioning guides. Specify pre-occupancy baseline IAQ testing at time of commissioning. Test for indoor air concentrations of CO, CO<sub>2</sub>, total VOCs and particulates. Test to assure that adequate ventilation rates have been achieved prior to initial occupancy.

**3.R2 Minimum Energy Performance <sup>(1)</sup>****Reqd.**

**Intent:** Establish the minimum level of energy efficiency for the base building and systems.

**Requirement:** ☐ Design to meet building energy efficiency and performance as required by TI 800-01 (Design Criteria).

**Technologies /Strategies:** Use building modeling and analysis techniques to establish and document compliance. ASHRAE/IESNA 90.1-1999 provides guidance for establishing building base case development and analysis. Refer to the LEED Reference Guide for a wide variety of energy efficiency strategy resources.

Use a professionally recognized and proven computer program or programs that integrate architectural features with air-conditioning, heating, lighting, and other energy producing or consuming systems. These programs will be capable of simulating the features, systems, and thermal loads used in the design. Using established weather data files, the program will perform 8760 hourly calculations. BLAST, DOE-2 or EnergyPlus are acceptable programs for these purposes.

**3.R3 CFC Reduction in HVAC&R Equipment <sup>(2)</sup>****Reqd.**

**Intent:** Reduce ozone depletion.

**Requirement:** ☐ Zero use of CFC-based refrigerants in new base building HVAC&R systems. When reusing existing base building HVAC equipment, complete a comprehensive CFC phaseout conversion.

**Technologies /Strategies:** Specify only non-CFC-based refrigerants in all base building HVAC&R systems.

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## 3.0 Energy and Atmosphere (Continued)

### 3.C1 Optimize Energy Performance <sup>(1)</sup>

**Intent:** Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associated with excessive energy use.

**Requirement:** ☐ Reduce design energy usage (DEU) compared to the energy use budget (EUB) in joules per square meter per year for regulated energy components as described in the requirements of Chapter 11 of the TI 800-01 (Design Criteria), as demonstrated by a whole building simulation. **20**

- 1 Point will be awarded for every reduction in design energy use of 2.5% for both new and existing facilities for a maximum score of 20 points.

Regulated energy components include HVAC systems, building envelope, service hot water systems, lighting and other regulated systems as defined by ASHRAE.

**Technologies /Strategies:** Develop and use building modeling and analysis techniques to establish a base case that meets the minimum prerequisite standard. ASHRAE/IESNA 90.1-1999 provides guidance for establishing building base case development and analysis. Perform interactive energy use analysis for selected design elements that affect energy performance and document compliance.

Unit of measure for performance shall be annual energy usage in joules per square meter. Life-Cycle energy costs shall be determined using rates for purchased energy, such as electricity, gas, oil, propane, steam, and chilled water and approved by the adopting authority. Refer to the LEED Reference Guide or Whole Building Design Guide for a wide variety of energy efficiency resources and strategies including conservation measures, electromechanical energy efficiency technologies (for example ground-source heat pumps), passive heating and cooling strategies, solar hot water, and daylighting.

Life-Cycle costing will be done in accordance with 10 CFR 436.

Consider installation of an Energy Management and Control System (EMCS), which is compatible with existing installation systems to optimize performance. Use sensors to control loads based on occupancy, schedule and/or the availability of natural resources use (day light or natural ventilation).

### 3.C2 Renewable Energy <sup>(1)</sup>

**Intent:** Encourage and recognize increasing levels of self-supply through renewable technologies to reduce environmental impacts associated with fossil fuel energy use.

**Requirement:** ☐ Supply a net fraction of the building's total energy use through the use of on-site renewable energy systems.

#### % of Total Annual Energy Usage in Renewables

5%	1
10%	2
15%	3
20%	4

**Technologies /Strategies:** Employ the use of on-site non-polluting-source renewable technologies contributing to the total energy requirements of the project. Consider and use high temperature solar and/or geothermal, photovoltaics, wind, biomass (other than unsustainably harvested wood), and bio-gas. Passive solar, solar hot water heating, ground-source heat pumps, and daylighting do not qualify for points under this credit. Credit for these strategies is given in Energy & Atmosphere Credit 1: Optimizing Energy Performance.

<sup>(1)</sup> Adapted material not reviewed or endorsed by U. S. Green Building Council.

## 3.0 Energy and Atmosphere (Continued)

### 3.C3 Additional Commissioning <sup>(2)</sup>

Intent: Verify and ensure that the entire building is designed, constructed, and calibrated to operate as intended.

Requirement: ☐ In addition to the Fundamental Building Commissioning prerequisite, implement the following additional commissioning tasks: 1

1. Conduct a focused review of the design prior to the construction documents phase.
2. Conduct a focused review of the construction documents when close to completion.
3. Conduct a selective review of contractor submittals of commissioned equipment.
4. Develop a system and energy management manual.
5. Have a contract in place for a near-warranty end or post occupancy review.

Items 1, 2, and 3 must be performed by someone other than the designer.

Technologies /Strategies: Introduce standards and strategies into the design process early, and then carry through selected measures by clearly stating target requirements in the construction documents. Tie contractor final payments to documented system performance. Refer to the LEED Reference Guide for detailed descriptions of required elements and references to additional guidelines.

### 3.C4 << Deleted >> <sup>(1)</sup>

### 3.C5 Measurement and Verification <sup>(1)</sup>

Intent: Provide for the ongoing accountability and optimization of building energy and water consumption performance over time.

Requirement: ☐ Comply with the installed equipment requirements for continuous metering as stated in selected Measurement and Verification Methods - Option B: Retrofit Isolation of the US DOE's International Performance Measurement and Verification Protocol (IPMVP) for the following: 1

- Lighting systems and controls.
- Constant and variable motor loads.
- Variable frequency drive (VFD) operation.
- Chiller efficiency at variable loads (kW/ton).
- Cooling load.
- Air and water economizer and heat recovery cycles.
- Air distribution static pressures and ventilation air volumes.
- Boiler efficiencies.
- Building specific process energy efficiency systems and equipment.
- Indoor water risers and outdoor irrigation systems.

Technologies /Strategies: Design and specify equipment to be installed in base building systems to allow for comparison, management, and optimization of actual vs. estimated energy and water performance. Employ building automation systems to perform M&V functions where applicable. Tie contractor final payments to documented M&V system performance and include in the commissioning report. Provide for ongoing M&V system maintenance and operating plan in building operations and maintenance manuals. Consider installation/base of an Energy Management and Control System (EMCS), which is compatible with existing installation/base systems to optimize performance.

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## 3.0 Energy and Atmosphere (Continued)

### 3.C6 Green Power <sup>(1)</sup>

Intent: Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.

Requirement: ☐ Engage in a two year contract to purchase the amount of power equal to projected building consumption generated from renewable sources that meet the Center for Resource Solutions (CRS) Green-E requirements. 1

Technologies /Strategies: Purchase power from a provider that guarantees a fraction of its delivered electric power is from net nonpolluting renewable technologies. Begin by contacting local utility companies. If the project is in an open market state, investigate Green Power and Power Marketers licensed to provide power in that state. Grid power that qualifies for this credit originates from solar, wind, geothermal, biomass, or low-impact hydro sources. Low-impact hydro shall comply with the Low Impact Hydropower Certification Program.

### 3.C7 Distributed Generation

Intent: Encourage the development and use of distributed generation technologies, which are less polluting than grid-source energy.

Requirement: ☐ Reduce total energy usage and emissions by considering source energy implications and local cogeneration and direct energy conversion. Generate at least 50% of the building's projected annual consumption by on-site distributed generation sources. 1

Technologies /Strategies: Investigate the use of integrated generation and delivery systems, such as co-generation, fuel cells, micro-turbines and off-peak thermal storage.

<sup>(1)</sup> Adapted material not reviewed or endorsed by U. S. Green Building Council.

**4.R1 Storage & Collection of Recyclables <sup>(1)</sup>****Reqd.**

Intent: Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

Requirement: ☐ Provide an easily accessible area that serves the entire building that is dedicated to the separation, collection and storage of materials for recycling including (at a minimum) paper, glass, plastics, and metals.

Technologies /Strategies: Establish a waste management plan which meets requirements of the installation/base environmental and/or solid waste management plans in cooperation with users to encourage recycling. Reserve space for recycling functions early in the building occupancy programming process and show areas dedicated to collection of recycled materials on space utilization plans. Broader recycling support space considerations should allow for collection and storage of the required elements and newspaper, organic waste (food and soiled paper), and dry waste. When collection bins are used, bin(s) should be able to accommodate a 75% diversion rate and be easily accessible to custodial staff and recycling collection workers. Consider bin designs that allow for easy cleaning to avoid health issues.

**4.C1 Building Reuse <sup>(1)</sup>**

Intent: Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste, and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Requirement: Reuse large portions of existing structures during renovation or redevelopment projects.

- ☐ Maintain at least 75% of existing building structure and shell (exterior skin and framing excluding window assemblies). 1
- ☐ Maintain an additional 25% (100% total) of existing building structure and shell (exterior skin and framing excluding window assemblies). 1
- ☐ Maintain 100% of existing building structure and shell AND 50% non-shell (walls, floor coverings, and ceiling systems). 1

Technologies /Strategies: Evaluate retention of existing structure. Consider facade preservation, particularly in installation/base areas. During programming and space planning, consider adjusting needs and occupant use patterns to fit within existing building structure and interior partition configurations. Identify and effectively address energy, structural, and indoor environmental (lead & asbestos) issues in building reuse planning and deconstruction documents. Percentage of reused non-shell building portions will be calculated as the total area (s.f.) of reused walls, floor covering, and ceiling systems, divided by the existing total area (s.f.) of walls, floor covering, and ceiling systems.

**4.C2 Construction Waste Management <sup>(1)</sup>**

Intent: Divert construction, demolition, and land clearing debris from landfill disposal. Redirect recyclable material back to the manufacturing process.

Requirement: Develop and implement a waste management plan, quantifying material diversion by weight:

- ☐ Recycle and/or salvage at least 50% (by weight) of construction, demolition, and land clearing waste. 1
- ☐ Recycle and/or salvage an additional 25% (75% total by weight) of the construction, demolition, and land clearing debris. 1

Technologies /Strategies: Develop and specify a waste management plan which meets requirements of the installation/base environmental and/or solid waste management plans that identifies licensed haulers and processors of recyclables; identifies markets for salvaged materials; employs deconstruction, salvage, and recycling strategies and processes, includes waste auditing; and documents the cost for recycling, salvaging, and reusing materials. Source reduction on the job site should be an integral part of the plan.

The plan should address recycling of corrugated cardboard, metals, concrete brick, asphalt, land clearing debris (if applicable), beverage containers, clean dimensional wood, plastic, glass, gypsum board, and carpet; evaluate the cost-effectiveness of recycling rigid insulation, engineered wood products and other materials; hazardous materials storage and management; and participation in manufacturers' "take-back" programs to the maximum extent possible. Refer to the LEED Reference Guide for guidelines and references that provide waste management plan development and implementation support including model bid specifications.

<sup>(1)</sup> Adapted material not reviewed or endorsed by U. S. Green Building Council.



## 4.0 Materials and Resources (Continued)

### 4.C3 Resource Reuse <sup>(2)</sup>

Intent: Extend the life cycle of targeted building materials, reducing environmental impacts related to materials manufacturing and transport.

- Requirement: ☐ Specify salvaged or refurbished materials for 5% of building materials. 1
- ☐ Specify salvaged or refurbished materials for 10% of building materials. 1

Technologies /Strategies: Commonly salvaged building materials include wood flooring/ panelling/cabinets, doors and frames, mantels, iron work and decorative lighting fixtures, brick, masonry and heavy timbers. See the LEED Reference Guide for calculation tools and guidelines. Determine percentages in terms of dollar value using the following steps:

1. Calculate total dollars\* (see exclusions) of the salvaged or refurbished material.
2. Calculate total dollars (see exclusions) of all building materials.
3. Divide Step 1 by Step 2 to determine the percentage.

Exclusions: In total dollar calculations, exclude; labor costs; all mechanical and electrical material and labor costs; and project overhead and fees. \*If the cost of the salvaged or refurbished material is below market value, use replacement cost to estimate the material value, otherwise use actual cost to the project.

### 4.C4 Recycled Content <sup>(1)</sup>

Intent: Increase demand for building products that have incorporated recycled content material, reducing the impacts resulting from extraction of new material.

- Requirement: ☐ Specify a minimum of 25% of building materials that contain in aggregate a minimum weighted average of 20% post-consumer recycled content material, OR, a minimum weighted average of 40% post-industrial recycled content material. 1
- ☐ Specify an additional 25% (50% total) of building materials that contain in aggregate, a minimum weighted average of 20% post consumer recycled content material, OR, a minimum weighted average of 40% post-industrial recycled content material. 1

Technologies /Strategies: Specify building materials containing recycled content for a fraction of total building materials. Select products and materials with supporting information from the AIA Resource Guide or the EPA Environmentally Preferable Purchasing (EPP) Program. Common building materials and products with recycled content include; wall, partition, and ceiling materials and systems; insulation; tiles and carpets; cement, concrete, and reinforcing metals; structural and framing steel. For products/materials not listed, selection should be made on the basis of EPP criterion and/or:

- Toxicity;
- Embodied energy;
- Production use of water, energy and ozone depleting substances (ODSs);
- Production limits on toxic emissions and effluents;
- Minimal, reusable or recycled/recyclable packaging;
- Impact on indoor environmental quality (IEQ);
- Installation that limits generation of waste;
- Materials that limit waste generation over their life;
- EPA guideline compliance; and
- Harvested on a sustainable yield basis.

See the LEED Reference Guide for a summary of the EPA guidelines and calculation methodology guidelines. Determine percentages in terms of dollar value using the following steps:

1. Calculate total dollars (see exclusions) of the material that contain recycled content.
2. Calculate total dollars (see exclusions) of all building materials.
3. Divide Step 1 by Step 2 to determine the percentage.

Exclusions: Labor costs; all mechanical and electrical material and labor costs; project overhead and fees)

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## 4.0 Materials and Resources (Continued)

### 4.C5 Local/Regional Materials <sup>(2)</sup>

**Intent:** Increase demand for building products that are manufactured locally, reducing the environmental impacts resulting from transportation, and supporting the local economy.

**Requirement:** ☐ Specify a minimum of 20% of building materials that are manufactured regionally within a radius of 500 miles. 1

☐ Of these regionally manufactured materials, specify a minimum of 50% that are extracted, harvested, or recovered within 500 miles. 1

**Technologies /Strategies:** Specify and install regionally extracted, harvested, and manufactured building materials. Contact the state and local waste management boards for information about regional building materials. See the LEED Reference Guide for calculation methodology guidelines. Determine percentages in terms of dollar value using the following steps:

1. Calculate total dollars (see exclusions) of material that is locally or regionally manufactured.
2. Calculate total dollars (see exclusions) of all building materials.
3. Divide Step 1 by Step 2 to determine the percentage.

Exclusions: Labor costs; all mechanical and electrical material and labor costs; project overhead and fees.

### 4.C6 Rapidly Renewable Materials <sup>(2)</sup>

**Intent:** Reduce the use and depletion of finite raw and long cycle renewable materials by replacing them with rapidly renewable materials.

**Requirement:** ☐ Specify rapidly renewable building materials for 5% of total building materials. 1

**Technologies /Strategies:** Rapidly renewable resources are those materials that substantially replenish themselves faster than traditional extraction demand (e.g. planted and harvested in less than a 10 year cycle) and do not result in significant biodiversity loss, increase erosion, air quality impacts, and that are sustainably managed. See the LEED Reference Guide for calculation methodology guidelines. Determine percentages in terms of dollar value using the following steps:

1. Calculate total dollars (see exclusions) of materials that are considered to be rapidly renewable.
2. Calculate total dollars (see exclusions) of all building materials.
3. Divide Step 1 by Step 2 to determine the percentage.

Exclusions: Labor costs; all mechanical and electrical material and labor costs; project overhead and fees.

### 4.C7 Certified Wood <sup>(2)</sup>

**Intent:** Encourage environmentally responsible forest management.

**Requirement:** ☐ Use a minimum of 50% of wood-based materials certified in accordance with the Forest Stewardship Council guidelines for wood building components including but not limited to framing, flooring, finishes, furnishings, and non-rented temporary construction applications such as bracing, concrete form work and pedestrian barriers. 1

**Technologies /Strategies:** Refer to the Forest Stewardship Council guidelines for wood building components that qualify for compliance to the requirements and incorporate into material selection for the project.

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**5.R1 Minimum IAQ Performance <sup>(1)</sup>****Reqd.**

**Intent:** Establish minimum IAQ performance to prevent the development of indoor air quality problems in buildings, maintaining the health and well being of the occupants.

**Requirement:** ☐ Meet the minimum requirements of voluntary consensus standard ASHRAE 62-1999, Ventilation for Acceptable Indoor Air Quality and approved Addenda.

**Technologies /Strategies:** Include proactive design details that will eliminate some of the common causes of indoor air quality problems in buildings. Introduce standards into the design process early. Incorporate references to targets in plans and specifications. Ensure ventilation system outdoor air capacity can meet standards in all modes of operation. Locate building outdoor air intakes (including operable windows) away from potential pollutants/contaminant sources such as sporulating plants (allergens), loading areas, building exhaust fans, cooling towers, sanitary vents, dumpsters, vehicular exhaust, and other sources. Include operational testing in the building commissioning report. Design cooling coil drain pans to ensure complete draining. Include measures to control and mitigate radon buildup in areas where it is prevalent. Limit humidity to a range that minimizes mold growth and promotes respiratory health.

**5.R2 Environmental Tobacco Smoke (ETS) Control <sup>(2)</sup>****Reqd.**

**Intent:** Prevent exposure of building occupants and systems to Environmental Tobacco Smoke (ETS).

**Requirement:** ☐ Zero exposure of nonsmokers to ETS by prohibition of smoking in the building, OR, by providing a designated smoking room designed to effectively contain, capture and remove ETS from the building. At a minimum, the smoking room shall be directly exhausted to the outdoors with no recirculation of ETS-containing air to the non-smoking area of the building, enclosed with impermeable structural deck-to-deck partitions and operated at a negative pressure compared with the surrounding spaces of at least 7 Pa (0.03 inches of water gauge). Performance of smoking rooms shall be verified using tracer gas testing methods as described in ASHRAE Standard 129-1997. Acceptable exposure in non-smoking areas is defined as less than 1% of the tracer gas concentration in the smoking room detectable in the adjoining non-smoking areas. Smoking room testing as described in the ASHRAE Standard 129-1997 is required in the contract documents and critical smoking facility systems testing results must be included in the building commissioning plan and report or as a separate document.

**Technologies /Strategies:** Prohibit smoking in the building and/or provide designated smoking areas outside the building in locations where ETS cannot reenter the building or ventilation system and away from high building occupant or pedestrian traffic.

**5.C1 IAQ Monitoring <sup>(1)</sup>**

**Intent:** Provide capacity for indoor air quality (IAQ) monitoring to sustain long term occupant health and comfort.

**Requirement:** ☐ Install a permanent carbon dioxide (CO<sub>2</sub>) monitoring system that provides feedback on space ventilation performance in a form that affords operational adjustments, AND specify initial operational set point parameters that maintain indoor carbon dioxide levels no higher than outdoor levels by more than 530 parts per million at any time.

1

**Technologies /Strategies:** Install an independent system or make CO<sub>2</sub> monitoring a function of the building automation system. Situate monitoring locations in areas of the building with high occupant densities and at the ends of the longest runs of the distribution ductwork. Specify that system operation manuals require calibration of all of the sensors per manufacturer recommendations but not less than one year. Include sensor and system operational testing and initial set point adjustment in the commissioning plan and report. Also consider periodic monitoring of carbon monoxide (CO), total volatile organic compounds (TVOCs), and particulates (including PM10).

<sup>(1)</sup> Adapted material not reviewed or endorsed by U. S. Green Building Council.

<sup>(1)</sup> Adapted material not reviewed or endorsed by U. S. Green Building Council.

## 5.0 Indoor Environmental Quality (IEQ) (Continued)

### 5.C2 Increase Ventilation Effectiveness <sup>(2)</sup>

Intent: Provide for the effective delivery and mixing of fresh air to building occupants to support their health, safety, and comfort.

Requirement: ☐ For mechanically ventilated buildings, design ventilation systems that result in an air change effectiveness (E) greater than or equal to 0.9 as determined by ASHRAE 129-1997. For naturally ventilated spaces demonstrate a distribution and laminar flow pattern that involves not less than 90% of the room or zone area in the direction of air flow for at least 95% of hours of occupancy. 1

Technologies /Strategies: Employ architectural and HVAC design strategies to increase ventilation effectiveness and prevent short-circuiting of airflow delivery. Techniques available include use of displacement ventilation, low velocity, and laminar flow ventilation (under floor or near floor delivery) and natural ventilation. Operable windows with an architectural strategy for natural ventilation, cross ventilation, or stack effect can be appropriate options with study of inlet areas and locations. See the LEED Reference Guide for compliance methodology guidelines.

### 5.C3 Construction IAQ Management Plan <sup>(2)</sup>

Intent: Prevent indoor air quality problems resulting from the construction/renovation process, to sustain long term installer and occupant health and comfort.

Requirement: Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:

☐ During construction meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings under Construction, 1995, AND protect stored on-site or installed absorptive materials from moisture damage, AND replace all filtration media immediately prior to occupancy (Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ASHRAE 52.2-1999). 1

☐ Conduct a minimum two-week building flushout with new filtration media at 100% outside air after construction ends and prior to occupancy, OR, conduct a baseline indoor air quality testing procedure consistent with current EPA protocol for Environmental Requirements, Baseline IAQ and Materials, for the Research Triangle Park Campus, Section 01445. 1

Technologies /Strategies: Specify containment control strategies including protecting the HVAC system, controlling pollutant sources, interrupting pathways for contamination, enforcing proper housekeeping and coordinating schedules to minimize disruption. Specify the construction sequencing to install absorptive materials after the prescribed dry or cure time of wet finishes to minimize adverse impacts on indoor air quality. Materials directly exposed to moisture through precipitation, plumbing leaks, or condensation from the HVAC system are susceptible to microbial contamination. Absorptive materials to protect and sequence installation include; insulation, carpeting, ceiling tiles, and gypsum products. Appoint an IEQ Manager with owner's authority to inspect IEQ problems and require mitigation as necessary.

### 5.C4 Low-Emitting Materials <sup>(2)</sup>

Intent: Reduce the quantity of indoor air contaminants that are odorous or potentially irritating to provide installer and occupant health and comfort.

Requirement: Meet or exceed VOC limits for adhesives, sealants, paints, composite wood products, and carpet systems as follows:

☐ Adhesives must meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168 by, AND all sealants used as a filler must meet or exceed Bay Area Air Resources Board Reg. 8, Rule 51. 1

☐ Paints and coatings must meet or exceed the VOC and chemical component limits of Green Seal requirements. 1

☐ Carpet systems must meet or exceed the Carpet and Rug Institute Green Label Indoor Air Quality Test Program. 1

☐ Composite wood or agrifiber products must contain no added urea-formaldehyde resins. 1

Technologies /Strategies: Evaluate and preferentially specify materials that are low emitting, non-irritating, nontoxic and chemically inert. Request and evaluate emissions test data from manufacturers for comparative products. Ensure that VOC limits are clearly stated in specifications, in General Conditions, or in each section where adhesives, sealants, coatings, carpets, and composite woods are addressed.

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## 5.0 Indoor Environmental Quality (IEQ) (Continued)

### 5.C5 Indoor Chemical and Pollutant Source Control <sup>(1)</sup>

Intent: Avoid exposure of building occupants to potentially hazardous chemicals that adversely impact air quality.

- Requirement: ☐ Design to minimize cross-contamination of regularly occupied areas by chemical pollutants: 1
- Employ permanent entryway systems (grills, grates, etc.) to capture dirt, particulates, etc. from entering the building at all high volume entryways, AND provide areas with structural deck to deck partitions with separate outside exhausting, no air recirculation and negative pressure where chemical use occurs (including housekeeping areas and copying/print rooms), AND provide drains plumbed for appropriate disposal of liquid waste in spaces where water and chemical concentrate mixing occurs.

Technologies /Strategies: Design to physically isolate activities associated with chemical contaminants from other locations in the building, providing dedicated systems to contain and remove chemical pollutants from source emitters at source locations. Applicable measures include eliminating or isolating high hazard areas; designing all housekeeping chemical storage and mixing areas (central storage facilities and janitors closets) to allow for secure product storage; designing copy/fax/printer/printing rooms with structural deck to deck partitions and dedicated exhaust ventilation systems; and including permanent architectural entryway system(s) to catch and hold particles to keep them from entering and contaminating the building interior.

Consider utilization of EPA registered anti-microbial treatments in carpet, textile or vinyl wall coverings, ceiling tiles or paints where microbial contamination is a concern. Utilize "breathable" wall finishes where circumstances require, to reduce moisture build-up and prevent microbial contamination. Minimize selection of fibrous materials, e.g. insulation, carpet and padding and flexible fabrics, whose exposed surfaces when exposed to the air stream or occupied space can contribute significant emissions and absorb and re-emit other contaminants over time.

### 5.C6 Controllability of Systems <sup>(2)</sup>

Intent: Provide a high level of individual occupant control of thermal, ventilation, and lighting systems to support optimum health, productivity, and comfort conditions.

- Requirement: ☐ Provide a minimum of one operable window and one lighting control zone per 200 s.f. for all occupied areas within 15 feet of the perimeter wall. 1
- ☐ Provide controls for each individual for airflow, temperature, and lighting for 50% of the non perimeter, regularly occupied areas. 1

Technologies /Strategies: Provide individual or integrated controls systems that control lighting, airflow, and temperature in individual rooms and/or work areas. Consider combinations of ambient and task lighting control and operable windows for perimeter and VAV systems for non perimeter with a 1:1: 2 terminal box to controller to occupant ratio.

### 5.C7 Thermal Comfort <sup>(2)</sup>

Intent: Provide for a thermally comfortable environment that supports the productive and healthy performance of the building occupants.

- Requirement: ☐ Comply with ASHRAE Standard 55-1992, Addenda 1995 for thermal comfort standards including humidity control within established ranges per climate zone. 1
- ☐ Install a permanent temperature and humidity monitoring system configured to provide operators control over thermal comfort performance and effectiveness of humidification and/or dehumidification systems in the building. 1

Technologies /Strategies: Integrated envelope and HVAC system design strategies that achieve thermal comfort conditions based on mean radiant temperature, local air velocity, relative humidity, and air temperature. Install and maintain a temperature and humidity monitoring system for key areas of the building (i.e., at the perimeter, and spaces provided with humidity control). This function can be satisfied by the building automation system. Specify in system operation manuals that all sensors require quarterly calibration. Include criteria verification and system operation in commissioning plan and report.

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## 5.0 Indoor Environmental Quality (IEQ) (Continued)

### 5.C8 Daylight and Views <sup>(2)</sup>

**Intent:** Provide a connection between indoor spaces and the outdoor environment through the introduction of sunlight and views into the occupied areas of the building.

- Requirement:**
- ☐ Achieve a minimum Daylight Factor of 2% (excluding all direct sunlight penetration) in 75% of all space occupied for critical visual tasks, not including copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas. Exceptions include those spaces where tasks would be hindered by the use of daylight or where accomplishing the specific tasks within a space would be enhanced by the direct penetration of sunlight. 1
  - ☐ Direct line of sight to vision glazing from 90% of all regularly occupied spaces, not including copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas. 1

**Technologies /Strategies:** Implement design strategies to provide access to daylight and views to the outdoors in a glare-free way using exterior sun shading, interior light shelves, and /or window treatments. Orient buildings to maximize daylighting options. Consider shallow or narrow building footprints. Employ courtyards, atriums, clerestory windows, skylights, and light shelves to achieve daylight penetration (from other than direct effect or direct rays from the sun) deep into regularly occupied areas of the building.

### 5.C9 Acoustic Environment /Noise Control

**Intent:** Provide appropriate acoustic conditions for user privacy and comfort.

- Requirement:**
- ☐ Minimize environmental noise through appropriate use of insulation, sound-absorbing materials and noise source isolation. 1

**Technologies /Strategies:** Evaluate each occupied environment and determine the appropriate layout, materials and furnishings design.

### 5.C10 Facility In-Use IAQ Management Plan

**Intent:** Insure the effective management of facility air quality during its life.

- Requirement:**
- ☐ Perform all of the following: 1
    - Develop an air quality action plan to include scheduled HVAC system cleaning.
    - Develop an air quality action plan to include education of occupants and facility managers on indoor pollutants and their roles in preventing them.
    - Develop an air quality action plan to include permanent monitoring of supply and return air, and ambient air at the fresh air intake, for carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), total volatile organic compounds (TVOCs), and particulates (including PM<sub>10</sub>).

**Technologies /Strategies:** Provide action plan for periodic system maintenance, monitoring, occupant/manager training.

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**6.C1****Holistic Delivery of Facility****Intent:**

Encourage a facility delivery process that actively engages all stakeholders in the design process to deliver a facility that meets all functional requirements while effectively optimizing tradeoffs among sustainability, first costs, life cycle costs and mission requirements.

**Requirement:**

- ☐ Choose team leaders that are experienced in holistic delivery of facilities. 1
- ☐ Train the entire team in the holistic delivery process. The team must include all stakeholders in the facility delivery, including the users, the contracting staff, the construction representatives, project manager, and design/engineering team members. 1
- ☐ Identify project goals and metrics. 1
- ☐ Plan and execute charrettes with team members at critical phases of the facility delivery. 1
- ☐ Identify and resolve tradeoffs among sustainability, first costs, life cycle costs and mission requirements through charrettes and other collaborative processes. 2
- ☐ Document required results for each phase of project deliverables that achieve the project goals and are measurable throughout the facility life span. 1

**Technologies /Strategies:**

Develop performance specifications or choose competitive range of products that meet environmental criteria.

Use automated modeling and analysis tools to assess site and facility design alternatives.

Conduct life-cycle cost analysis (LCCA) in the design process according to the Federal Facilities Council Technical Report, Sustainable Federal Facilities: A Guide To Integrating Value Engineering, Life Cycle Costing, and Sustainable Development, FFC # 142, 2000.

Conduct a full ecological assessment to include soil quality, water resources and flows, vegetation and trees, wildlife habitats and corridors, wetlands, and ecologically sensitive areas to identify the least sensitive site areas for development. Evaluate space utilization/functions to reduce overall space requirements, considering networking, flextime, flexi-place, dual-use, and other strategies to reduce space requirements/optimize facility size.

**7.C1**      **Operation and Maintenance**

**Intent:**      Encourage the development of a facility delivery process that enhances efficient operation and maintenance of the facility.

- |                     |  |          |
|---------------------|--|----------|
| <b>Requirement:</b> | <input type="checkbox"/> Develop a facility operations and maintenance program to include:   | <b>2</b> |
|                     | <ul style="list-style-type: none"> <li>▪ Commissioning instructions for all facility systems.</li> <li>▪ Comprehensive facility operations and maintenance instructions for system operation, performance verification procedures and results, an equipment inventory, warrantee information, and recommended maintenance schedule. The instructions should include a comprehensive, preventive maintenance program to keep all facility systems functioning as designed.</li> <li>▪ A periodic training program for occupants, facilities managers, and maintenance staff in all facility operations and maintenance activities.</li> <li>▪ Instructions on sustainable cleaning and pest control practices.</li> <li>▪ Develop a comprehensive site/facility recycling/waste management plan.</li> </ul> |          |
|                     | <input type="checkbox"/> Provide surfaces, furnishings, and equipment that are appropriately durable, according to life cycle cost analysis.   | <b>1</b> |

**Technologies /Strategies:**      Maintain facility elements, systems and subsystems on a routine maintenance schedule to ensure integrity and longevity.

Perform scheduled cleaning and maintenance activities with nontoxic environmentally preferable cleaning products and procedures. Keep air ducts clean and free of microorganisms through a structured program of preventive maintenance. Clean lighting systems following a regular maintenance schedule to ensure optimum light output and energy efficiency.

Use pesticides and herbicides sparingly and only when necessary with preference to natural methods and materials over poisons and toxic agents.

Use automated monitors and controls for energy, water, waste, temperature, moisture, and ventilation monitors and controls. Turn off the lights, computers, computer monitors, and equipment when not in use. Enable power-down features on office equipment.

**7.C2**      **Soldier and Workforce Productivity and Retention**

**Intent:**      Provide a high-quality, functional, healthy and safe work environment to promote soldier and workforce productivity and retention.

- |                     |  |          |
|---------------------|--|----------|
| <b>Requirement:</b> | <input type="checkbox"/> Provide a high quality indoor environment to enhance user/occupant quality of life (QOL). | <b>1</b> |
|                     | <input type="checkbox"/> Provide a highly functional work environment to promote user/occupant work productivity.  | <b>1</b> |
|                     | <input type="checkbox"/> Provide a healthy and safe work environment to sustain QOL and productivity.              | <b>1</b> |

**Technologies /Strategies:**      Use a registered/certified interior designer to provide stimulating interior environments with pleasant colors, surface treatments, room proportions and ceiling heights, external views, natural lighting, and quality detailing for interior furnishings, equipment, materials and finishes. Use IES standards to provide light to occupied space with variations in level, comfortable contrasts, natural color rendition, natural/man-made, and adequate controls to optimize light aesthetic qualities. Provide occupant control of individual work areas configuration, and lighting, thermal and ventilation systems.

Collaborate with end users to identify functional and technical requirements and to perform adjacency studies. Configure occupied space to address the specific workers/occupants functions and activities that will be carried out there. Meet TI 800-01 Design Guide requirements. Design and configure occupied space, and select furniture and equipment using human ergonomics. Identify existing user amenities, such as dining, recreation, socialization, shopping and child care facilities. Identify what amenities should be incorporated into the project or provided in the future, nearby facility. Provide ventilation air in sufficient volume free from natural and man made contaminants.



**8.C1 Functional Life of Facility and Supporting Systems**

Intent: Assess the functional life of a facility and its supporting systems to optimize the infrastructure investment.

- Requirement: ☐ Identify how long the designed function is likely to occupy the current facility. 1
- ☐ Identify how long the envelope, structure, HVAC, plumbing, communications, electrical, and other systems are likely to last before requiring replacement or upgrade. Consider economic, functional and physical obsolescence. 1

Technologies /Strategies: Assess the typical or likely lifespan of the function(s) to be accommodated to forecast eventual adaptation to a different use(s). Assess the life spans of the various building systems/components to forecast their revision/replacement during the facility lifespan and design in a manner that facilitates revision/replacement.

Consider the life span of the weapon systems, doctrines, or other programs supported by the facility.

Use life cycle data and other sources to identify the life span of the embodied systems.

**8.C2 Adaptation, Renewal and Future Uses**

Intent: Encourage facility design that is responsive to change over time to maximize accommodation of future uses without creating waste and insuring maximum useful life of products.

- Requirement: ☐ Identify possible future uses for the facility; consider alternatives that expand the list of possible future uses. AND Design the building to accommodate as wide a range of future uses, as practical. AND Design the installation of building systems to accommodate foreseeable change with a minimum amount of disruption, cost, and additional materials. 1
- ☐ Build the smallest facility necessary to meet current mission functional requirements, using the most efficient shape and form, while taking into consideration expansion capabilities and potential future mission requirements. AND Design the facility for recycling of materials and systems. 1

Technologies /Strategies: Create durable, long-lasting and adaptable facility shell and structural system. Create an adaptable, flexible facility design using open planning, service corridors, interstitial space, access floors, demountable walls/partitions, modular furniture and other adaptable space configuration/utilization strategies.

Select materials that are recyclable, avoiding composite materials, such as reinforced plastics and carpet fibers and backing. Consider selecting materials and labeling construction materials with identification information to facilitate recycling. Use pre-cut/pre-fabricated materials and use standard lengths and sizes (dimensional modularity) in design. Design facility systems and subsystems for reconfiguration and/or disassembly/recycling using reversible/reusable connectors.

## Facility Points Summary

1.0 Sustainable Sites (S)		Score	0	Max 20
1.R1	<input type="checkbox"/> Erosion, Sedimentation and Water Quality Control			[Required]
1.C1	<input type="checkbox"/> Site Selection			2
1.C2	<input type="checkbox"/> Installation/Base Redevelopment			2
1.C3	<input type="checkbox"/> Brownfield Redevelopment			1
1.C4	<input type="checkbox"/> Alternative Transportation			4
1.C5	<input type="checkbox"/> Reduced Site Disturbance			2
1.C6	<input type="checkbox"/> Stormwater Management			2
1.C7	<input type="checkbox"/> Landscape and Exterior Design to Reduce Heat Islands			2
1.C8	<input type="checkbox"/> Light Pollution Reduction			1
1.C9	<input type="checkbox"/> Optimize Site Features			1
1.C10	<input type="checkbox"/> Facility Impact			2
1.C11	<input type="checkbox"/> Site Ecology			1
2.0 Water Efficiency (W)		Score	0	Max 5
2.C1	<input type="checkbox"/> Water Efficient Landscaping			2
2.C2	<input type="checkbox"/> Innovative Wastewater Technologies			1
2.C3	<input type="checkbox"/> Water Use Reduction			2
3.0 Energy and Atmosphere (E)		Score	0	Max 28
3.R1	<input type="checkbox"/> Fundamental Building Systems Commissioning			[Required]
3.R2	<input type="checkbox"/> Minimum Energy Performance			[Required]
3.R3	<input type="checkbox"/> CFC Reduction in HVAC&R Equipment			[Required]
3.C1	<input type="checkbox"/> Optimize Energy Performance			20
3.C2	<input type="checkbox"/> Renewable Energy			4
3.C3	<input type="checkbox"/> Additional Commissioning			1
3.C4	<input type="checkbox"/> <<Deleted>>			
3.C5	<input type="checkbox"/> Measurement and Verification			1
3.C6	<input type="checkbox"/> Green Power			1
3.C7	<input type="checkbox"/> Distributed Generation			1
4.0 Materials and Resources (M)		Score	0	Max 13
4.R1	<input type="checkbox"/> Storage & Collection of Recyclables			[Required]
4.C1	<input type="checkbox"/> Building Reuse			3
4.C2	<input type="checkbox"/> Construction Waste Management			2
4.C3	<input type="checkbox"/> Resource Reuse			2
4.C4	<input type="checkbox"/> Recycled Content			2
4.C5	<input type="checkbox"/> Local/Regional Materials			2
4.C6	<input type="checkbox"/> Rapidly Renewable Materials			1
4.C7	<input type="checkbox"/> Certified Wood			1
5.0 Indoor Environmental Quality (IEQ) [Q]		Score	0	Max 17
5.R1	<input type="checkbox"/> Minimum IAQ Performance			[Required]
5.R2	<input type="checkbox"/> Environmental Tobacco Smoke (ETS) Control			[Required]
5.C1	<input type="checkbox"/> IAQ Monitoring			1
5.C2	<input type="checkbox"/> Increase Ventilation Effectiveness			1
5.C3	<input type="checkbox"/> Construction IAQ Management Plan			2
5.C4	<input type="checkbox"/> Low-Emitting Materials			4
5.C5	<input type="checkbox"/> Indoor Chemical and Pollutant Source Control			1
5.C6	<input type="checkbox"/> Controllability of Systems			2
5.C7	<input type="checkbox"/> Thermal Comfort			2
5.C8	<input type="checkbox"/> Daylight and Views			2
5.C9	<input type="checkbox"/> Acoustic Environment /Noise Control			1
5.C10	<input type="checkbox"/> Facility In-Use IAQ Management Plan			1

Maximum  
Points

6.0	Facility Delivery Process (P)	Score	0	Max 7
6.C1	<input type="checkbox"/> Holistic Delivery of Facility			7
7.0	Current Mission	Score	0	Max 6
7.C1	<input type="checkbox"/> Operation and Maintenance			3
7.C2	<input type="checkbox"/> Soldier and Workforce Productivity and Retention			3
8.0	Future Missions	Score	0	Max 4
8.C1	<input type="checkbox"/> Functional Life of Facility and Supporting Systems			2
8.C2	<input type="checkbox"/> Adaptation, Renewal and Future Uses			2
Total Score			0	Max 100

<b>SPIRIT Bronze</b>	<b>25 to 34 Points</b>
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<b>SPiRiT Silver</b>		<b>35 to 49 Points</b>
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**SPIRiT Gold** | **50 to 74 Points****SPiRiT Platinum** 75 to 100 Points

## Project Points of Contact

[illegible]

## SPiRiT Comment Sheet

**Please forward any comments that you may have on this Sustainable Project Rating Tool, preferably by Email, to:**

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**SPIRiT Para.**

[illegible]

## 4.9 SPIRiT CHECKLIST

WHOLE BARRACKS RENEWAL BRIGADE COMPLEX, PHASE 3A

SCHOFIELD BARRACKS, OAHU, HAWAII

MITSUNAGA AND ASSOCIATES, INC.

APRIL 2002



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SPiRiT Sustainable Project Summary			PROPOSED POINTS	MAX POINTS
1.0	Sustainable Sites		13	20
2.0	Water Efficiency		0	5
3.0	Energy and Atmosphere		2	28
4.0	Materials and Resources		4	13
5.0	Indoor Environmental Quality (IEQ)		8	17
6.0	Facility Delivery Process		7	7
7.0	Current Mission		4	6
8.0	Future Mission		4	4
		Totals	<b>Silver 42</b>	<b>100</b>

SPiRiT Sustainable Project Levels		
SPIRiT Bronze		25 to 34 Points
SPIRiT Silver		35 to 49 Points
SPIRiT Gold		50 to 74 Points
SPIRiT Platinum		75 to 100 Points

1.0 SUSTAINABLE SITES:			Proposed Points	13	Possible Points	20
Y		1.R1	Erosion, Sedimentation, and Water Quality Control.			Req'd
Y		1.C1.1	Site Selection: Avoid development of inappropriate sites.			1
Y		1.C1.2	Site Selection: Select site based on functional adjacency and land use compatibility.			1
Y		1.C2.1	Installation/Base Redevelopment: Increase localized density.			1
Y		1.C2.2	Installation/Base Redevelopment: Select sites close to existing roads and utilities.			1
	N	1.C3	Brownfield Redevelopment			1
Y		1.C4.1	Alternative Transportation: Installation/base transit system access.			1
Y		1.C4.2	Alternative Transportation: Provide bicycle racks and changing/shower facilities			1
	N	1.C4.3	Alternative Transportation: Locate near alternative fuel refueling stations.			1
Y		1.C4.4	Alternative Transportation: Size parking capacity and provide preferred parking.			1
	N	1.C5.1	Reduced Site Disturbance: Protect OR restore previously developed sites.			1
	?	1.C5.2	Reduced Site Disturbance: Reduce the development footprint.			1
Y		1.C6.1	Stormwater Management: Implement a stormwater management plan.			1

## 4.9 SPIRiT CHECKLIST

WHOLE BARRACKS RENEWAL BRIGADE COMPLEX, PHASE 3A

SCHOFIELD BARRACKS, OAHU, HAWAII

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			N	1.C6.2	Stormwater Management: Implement EPA's Best Management Practices.	1
Y				1.C7.1	Landscape and Exterior Design to Reduce Heat Islands: Provide shade on the site.	1
Y				1.C7.2	Landscape and Exterior Design to Reduce Heat Islands: Energy Star compliant roof.	1
Y				1.C8	Light Pollution Reduction.	1
			N	1.C9	Optimize Site Features.	1
Y				1.C10.1	Facility Impact: Cluster facilities to reduce site impact and support mass transit.	1
Y				1.C10.2	Facility Impact: Identify and mitigate potential impacts beyond site boundaries.	1
	?			1.C11	Site Ecology.	1

2.0 WATER EFFICIENCY					Proposed Points	0	Possible Points	5
		?	N	2.C1.1	Water Efficient Landscaping: Use technology OR capture or recycle site water.			1
			N	2.C1.2	Water Efficient Landscaping: Use only captured or recycled water; no irrigation system.			1
			N	2.C2	Innovative Wastewater Technologies.			1
		?	N	2.C3.1	Water Use Reduction: Reduce water use by 20%.			1
			N	2.C3.2	Water Use Reduction: Reduce water use by 30%.			1

3.0 ENERGY AND ATMOSPHERE					Proposed Points	2	Possible Points	28
Y				3.R1	Fundamental Building Systems Commissioning			Req'd
Y				3.R2	Minimum Energy Performance (TI 800-01)			Req'd
Y				3.R3	CFC Reduction in HVAC&R Equipment			Req'd
2			N	3.C1	Optimize Energy Performance: 1 point per 2.5% energy reduction.			20
			N	3.C2.1	Renewable Energy: 5% on-site renewable energy system.			1
			N	3.C2.2	Renewable Energy: 10% on-site renewable energy system.			1
			N	3.C2.3	Renewable Energy: 15% on-site renewable energy system.			1
			N	3.C2.4	Renewable Energy: 20% on-site renewable energy system.			1
			N	3.C3	Additional Commissioning			1
				3.C4	(Not Used)			
		?	N	3.C5	Measurement and Verification			1
		?	N	3.C6	Green Power			1
		?	N	3.C7	Distributed Generation			1

4.0 MATERIALS & RESOURCES					Proposed Points	4	Possible Points	13
Y				4.R1	Storage & Collection of Recyclables			Req'd
Y				4.C1.1	Building Reuse: Maintain at least 75% of existing building structure and shell.			1
Y				4.C1.2	Building Reuse: Maintain 100% of existing building structure and shell.			1
			N	4.C1.3	Building Reuse: Maintain 100% of existing building structure, shell and 50% non-shell systems.			1
			N	4.C2.1	Construction Waste Management: Recycle and/or salvage at least 50% of waste.			1
			N	4.C2.2	Construction Waste Management: Recycle and/or salvage at least 75% of waste.			1
			N	4.C3.1	Resource Reuse: Specify salvaged or refurbished materials for 5% of building materials.			1

## 4.9 SPIRIT CHECKLIST

WHOLE BARRACKS RENEWAL BRIGADE COMPLEX, PHASE 3A

SCHOFIELD BARRACKS, OAHU, HAWAII

MITSUNAGA AND ASSOCIATES, INC.

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		N	4.C3.2	Resource Reuse: Specify salvaged or refurbished materials for 10% of building materials.	1
		N	4.C4.1	Recycled Content: Specify 25% of materials that contain post-consumer recycled content.	1
		N	4.C4.2	Recycled Content: Specify 50% of materials that contain post-consumer recycled content.	1
Y			4.C5.1	Local/Regional Materials: Specify a minimum of 20% building materials that are made locally.	1
		N	4.C5.2	Local/Regional Materials: Of these (20%) a minimum 50% that are obtained locally.	1
		N	4.C6	Rapidly Renewable Materials	1
Y			4.C7	Certified Wood	1

5.0 INDOOR ENVIRONMENTAL QUALITY (IEQ)				Proposed Points	Possible Points	17
				8		
Y			5.R1	Minimum IAQ Performance		Req'd
Y			5.R2	Environmental Tobacco Smoke (ETS) Control		Req'd
		N	5.C1	Indoor Air Quality (IAQ) Monitoring		1
		N	5.C2	Increase Ventilation Effectiveness		1
Y			5.C3.1	Construction IAQ Management Plan: During construction IAQ requirements.		1
		N	5.C3.2	Construction IAQ Management Plan: Before occupancy IAQ requirements.		1
		N	5.C4.1	Low-Emitting Materials: Adhesive & Sealants.		1
	?	N	5.C4.2	Low-Emitting Materials: Paints.		1
	?	N	5.C4.3	Low-Emitting Materials: Carpets.		1
		N	5.C4.4	Low-Emitting Materials: Composite wood.		1
Y			5.C5	Indoor Chemical and Pollutant Source Control		1
Y			5.C6.1	Controllability of Systems: Provide high level of occupant perimeter controls.		1
		N	5.C6.2	Controllability of Systems: Provide high level of occupant non-perimeter controls.		1
Y			5.C7.1	Thermal Comfort: Provide shade on the site.		1
Y			5.C7.2	Thermal Comfort: Use Energy Star compliant roofing OR install a green roof.		1
Y			5.C8.1	Daylight and Views: 2% Daylight Factor in 75% of all occupied spaces.		1
		N	5.C8.2	Daylight and Views: Line of sight to vision glazing in 90% of all occupied spaces.		1
Y			5.C9	Acoustic Environment/Noise Control		1
Y			5.C10	Facility In-Use IAQ Management Plan		1

## 4.9 SPIRiT CHECKLIST

WHOLE BARRACKS RENEWAL BRIGADE COMPLEX, PHASE 3A

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6.0 FACILITY DELIVERY PROCESS					Proposed Points	7	Possible Points	7
Y				6.C1.1	Holistic Delivery of Facility: Choose leaders with holistic project delivery experience.			1
Y				6.C1.2	Holistic Delivery of Facility: Train PDT in the holistic delivery process.			1
Y				6.C1.3	Holistic Delivery of Facility: Identify project goals and metrics (PMP).			1
Y				6.C1.4	Holistic Delivery of Facility: Plan & execute charrettes with team members.			1
2				6.C1.5	Holistic Delivery of Facility: Identify and resolve conflicts in project requirements.			2
Y				6.C1.6	Holistic Delivery of Facility: Document required deliverables that achieve project goals.			1

7.0 CURRENT MISSION					Proposed Points	4	Possible Points	6
			N	7.C1.1	Operation and Maintenance: Develop a facility operations and maintenance program.			2
Y				7.C1.2	Operation and Maintenance: Provide durable material surfaces, furnishings & equipment.			1
Y				7.C2.1	Design for Soldier & Workforce Productivity & Retention: Enhance user's quality of life.			1
Y				7.C2.2	Design for Soldier & Workforce Productivity & Retention: Promote work productivity.			1
Y				7.C2.3	Design for Soldier & Workforce Productivity & Retention: Sustain QOL & productivity.			1

8.0 FUTURE MISSIONS					Proposed Points	4	Possible Points	4
Y				7.C1.1	Assess the Lifespan of the Designed Use and Supporting System: Identify function life.			1
Y				7.C1.2	Assess the Lifespan of the Designed Use and Supporting System: Identify systems life.			1
Y				7.C2.1	Design for Adaptation, Renewal and Future Uses: Design for flexibility.			1
Y				7.C2.2	Design for Adaptation, Renewal and Future Uses: Design today for tomorrow.			1



# **Sustainable Project Rating Tool (SPiRiT) Checklist**

## **1.0 SUSTAINABLE SITES**

- 1.C1.1 Site Selection: Did not develop building on inappropriate site; existing building on existing site.
- 1.C1.2 Site Selection: Existing site has functional relationships and adjacencies.
- 1.C2.1 Installation/Base Redevelopment: Existing site; did not develop in undeveloped area.
- 1.C2.2 Installation/ Base Redevelopment: Site close to roads and utilities
- 1.C4.1 Alternative Transportation: Site near transit system
- 1.C4.2 Alternative Transportation: Bike racks provided
- 1.C4.4 Alternative Transportation: Parking minimum not exceeded
- 1.C6.1 Stormwater Management: No increase in storm water runoff
- 1.C7.1 Reduce Heat Islands: Providing shade
- 1.C7.2 Reduce Heat Islands: Using high reflectance and low emissivity roofing
- 1.C8 Light Pollution: Not exceeding footcandle limit
- 1.C10.1 Facility Impact: Clustering facilities to reduce impact
- 1.C10.2 Facility impact: Collaborate with base of impact beyond site

## **3.0 ENERGY AND ATMOSPHERE**

- 3.C1 Optimize Energy Performance: Reduction of energy by at least 5%

## **4.0 MATERIALS & RESOURCES**

- 4.C1.1 Building Reuse: Maintain at least 75% of existing
- 4.C1.2 Building Reuse: Maintain an additional 25% of existing
- 4.C5.1 Local Materials: 20% of the products is local ( concrete )
- 4C7 Certified Wood: Use certified lumber

## **5.0 INDOOR ENVIROMENTAL QUALITY**

- 5.C3.1 Construction Plan: Meet requirements of SMACNA
- 5.C5 Indoor Control: Minimizing cross contamination
- 5.C6.1 Controllability of System: Providing windows and light control
- 5.C7.1 Thermal Comfort: Setpoint temperature of 75F +/- 2F and 50% RH complies with this requirement
- 5.C7.2 Thermal Comfort:

- 5.C8.1 Daylight: Achieving daylight in 75% of space
- 5.C9: Acoustic Control: Minimize noise through insulation
- 5.C10 IAQ Management Plan: Plan should be developed and implemented. In addition, provide DDC AND EMCS to provide accuracy.

## **6.0 FACILITY DELIVERY PROCESS**

- 6.C.1 Holistic Delivery: Leaders chosen for charette process
- 6C1.2 Holistic Delivery: Team was trained to participate in charette process
- 6.C1.3 Holistic Delivery: Project goals were identified
- 6.C1.4 Holistic Delivery: Charette conducted
- 6.C1.5 Holistic Delivery: Conducted during charette
- 6.C1.6 Holistic Delivery: Document produced

## **7.0 CURRENT MISSION**

- 7.C1.2 Operation and Maintenance: Providing durable materials
- 7.C2.1 Soldier Retention: Providing functional work environment
- 7.C2.2 Soldier Retention: Providing functional work environment
- 7.C2.3 Soldier Retention: Providing safe and healthy work environment

## **8.0 FUTURE MISSION**

- 8C1.1 Assess Lifespan: Identified function life
- 8C1.2 Assess Lifespan: Identified systems life cycle costs
- 8C2.1 Design for Adaption: Future use identified
- 8C2.2 Design for Adaption: Facility meets current mission with room for expansion

## POSSIBLE ADDITIONAL POINTS

2.C1.1 We can take this point with the use of efficiency irrigation technology in the way of rain sensors on timers. The cost impact is minimal; about \$500. We will be including this in the design.

3.C1 An additional 2 points should be achievable by providing heat recovery from condenser water for hot water preheating for a total DEU reduction of 10% below the EUB.

3.C3 Additional commissioning can be accomplished by the base facility. The cost to do this would be borne by the base since it would be an on going process.

3.C5 This can be included for an additional point as described in Spirit.

5.C4.1 This can be specified.

5C4.2 This can be specified.

5C4.3 This can be specified.

5C4.4 This can be specified.

7.C1.2 This can be included if the facility can be convinced to develop a plan for operations and maintenance

The cost to include these items would be approximately \$300,000, but the contractor should determine if the additional costs can be included within their construction budget or justified from a life cycle standpoint.

If 8 of these 10 items are used, then a gold rating could be attained.

## ATTACHMENT 29

### PROGRESSIVE COLLAPSE VULNERABILITY ASSESSMENT

# ***PROGRESSIVE COLLAPSE VULNERABILITY ASSESSMENT***

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WHOLE BARRACKS RENEWAL  
BRIGADE COMPLEX, PHASE 3A, QUAD C  
FY03 MCA PN52068 & BUP 52069  
SCHOFIELD BARRACKS, OAHU, HAWAII

## ***VOLUME ONE***

May 2003

### **PREPARED FOR:**

DEPARTMENT OF THE ARMY  
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Engineering Services Branch  
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Fort Shafter, Hawaii 96858-5440

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## 1.0 INTRODUCTION

This section summarizes the tasks performed by Hinman Consulting Engineers, Inc. and includes a discussion of progressive collapse on buildings. The site and buildings are described in Section 2. Section 4 summarizes the analysis and retrofit recommendations. Building layout sketches showing recommended retrofits and a list of drawings reviewed are included in the appendix.

### 1.1 Background

Mitsunaga & Associates, Inc. contracted Hinman Consulting Engineers, Inc. to perform an air-blast and progressive collapse vulnerability assessment and develop conceptual retrofit recommendations for Buildings 355, 356, 357, and 358 which comprise Quad "C" at Schofield Barracks in Oahu, Hawaii. This report assumes that parking restrictions at curblines and parking area access control measures are instituted so that air-blast hardening of the structure is not required. A summary of the methods, findings and recommendations of the progressive collapse assessment follows.

### 1.2 References

The following references were used in the preparation of this report:

- *DoD Anti-Terrorism / Force Protection (AT/FP) Minimum Standards for Buildings, UFC 4-010-01*, dated 31 July 2002 [1];
- *Department of Defense Interim Antiterrorism/Force Protection Construction Standards Guidance on Structural Requirements*, dated March 5, 2001 [2];
- Excerpts from the original design drawings, dated 1917. Drawings reviewed were primarily for Building 355;
- Drawings for the Modernization of Barracks Quads C& J and Medics Area, dated 1973;
- Corps of Engineers seismic upgrade drawings for FY03 MCA PN 52068 & BUP PN 52069 PH3A, dated 2001.

A detailed list of all drawings reviewed is included as an appendix to this report.

### 1.3 Tasks Performed

Based on above listed references, Hinman Consulting Engineers, inc. has performed the following tasks for this report:

- Performed static and dynamic analysis of perimeter structural elements to determine their resistance to progressive collapse; and
- Developed conceptual level retrofit schemes to bring the buildings into compliance with the requirements of the standards referenced above.

## 1.4 Limitations and Exclusions

The following are the limitations and exclusions of this report:

- Detailed design was not included in the scope of this work and is to be performed by the Design/Build contractor in consultation with a qualified consultant;
- Where specific drawings were not available, the following was assumed
  - Details provided for one building, were assumed to be the same for all buildings;
  - Where no details were available, layout and details found during our analysis of Schofield Barracks, Quad F, were assumed;
- Retrofit recommendations included in the Corps of Engineers seismic upgrade design drawings were assumed to be constructed and were therefore used in our analysis, where applicable;
- Site retrofits (i.e. installation of vehicle access arms at the entry points to the inner quad area) were assumed to be installed;
- Analysis of the recommended retrofits for standard and other abnormal loading conditions (i.e. seismic loading) was outside the scope of work and should be performed prior to final design and construction;
- Cost estimating was not included in the scope of work for this report; and
- Review of the project for overall compliance with Antiterrorism requirements aside from air-blast response and progressive collapse is beyond the scope of work for this report.

## 2.0 SITE AND BUILDING DESCRIPTION

This section describes the site layout and building descriptions.

### 2.1 Building Location and Layout

The four buildings are grouped together to form what is referred to as Quad C in Schofield Barracks on the island of Oahu, Hawaii. Quad C is located inside the Schofield Barracks facility, more than 150-feet from the installation perimeter. The Quad is surrounded by streets on four sides (Figure 1). Access roads lead into an inner quad area, which has recreation facilities as well as limited parking. This study assumes that vehicle control devices (i.e. access arms) are installed at the entrance to the access roads and parking areas within 82-feet (25 meters) so that only emergency and maintenance vehicles may gain access to these areas and that parking restrictions are instituted at street curblines so that the buildings are in compliance with section B-1.1.2.2.2 of the requirements and that hardening to mitigate air-blast effects is not required. Trees and shrubbery are scattered on the lawns around the perimeter of the buildings. A chiller plant and fire pump house are located east of Building 358.

### 2.2 Building Construction

All four buildings were constructed circa 1917 and have reinforced concrete floor slabs supported by reinforced concrete beams and columns. The exterior walls are 8-inch thick reinforced concrete at the first two floors, and 6-inches thick at the third floor. The original roof system for building 355 consisted of plywood supported by wood trusses. This has since been

modified to metal decking supported by steel open-web trusses. Additionally, per the seismic evaluation report by the Corps of Engineers, the roof system for Buildings 356, 357, and 358 is scheduled to be modified to metal decking supported by structural steel "I" beams. This is the system evaluated for the purposes of this report.

#### 2.2.1 Buildings 356, 357, and 358

Buildings 356, 357, and 358 are all rectangular with two "bump outs" located at the one-third points on the inner quad side of the buildings (see building layout sketches in the appendix).

These buildings have exterior corridors and stairs facing the inner quad. These exterior stairs are the only means of access and egress for the upper floors.

#### 2.2.2 Building 355

Building 355 is rectangular with an exterior corridor and stairs on the inner quad side of the building. Like the other buildings, the stairs provide the only means of access and egress for the upper floors. An open passageway at the center line of the building leads from the street to the inner quad area.

### 2.3 Building Classifications

The buildings will be used either for troop billeting or administrative functions (offices) and therefore are classified as 'Primary Gathering Structures' and 'Troop Billeting' by the AT/FP criteria.

## 3.0 MATERIAL PROPERTIES AND EVALUATION CRITERIA

Based on conversations with Jong Namgung of Mitsunaga & Associates, the following material properties are used for the analysis of the existing structures:

Reinforcing Steel:	$f_y = 40,000$ psi
Concrete:	$f'_c = 2,500$ psi
Structural Steel:	$f_y = 36,000$ psi

The evaluation criteria are based on material and structural member type. Table 4 shows the evaluation criteria used in the analysis for this report.

Table 4. Evaluation Criteria

Material	Structural Element	Air Blast Support Rotation	Air Blast Ductility
Concrete	Slabs	6 degrees	-
	Beams	6 degrees	-
	Walls	6 degrees	-
	Columns	6 degrees	-
Steel	Joists	-	6
	Beams	12 degrees	20
	Metal Deck	12 degrees	20



#### 4.0 PROGRESSIVE COLLAPSE REQUIREMENTS

Per the *Department of Defense Interim AT/FP Construction Standards Guidance on Structural Requirements*, typical scenarios were reviewed which involved removal of primary load-carrying elements at the building perimeter. The perimeter of the structure is defined as the extreme outside envelope of the building.

Structural members considered include existing concrete walls, and the exterior columns and beams at the exterior corridor. Typical members were selected for both the first floor and the upper floors.

Following the procedures in the Progressive Collapse Design guidelines, the following scenarios were reviewed:

- *Walls*: analyzed based on the removal of a section of the shear wall with a length equal to two times the height of the wall;
- *Walls*: at corner of buildings, analyzed based on the removal of a section of the shear wall with a length equal to the height of the wall;
- *Beams*: analyzed to determine the efficacy of the beams with the loss of one supporting column below; and
- *Columns*: analyzed for their ability to withstand loss of lateral support at one floor level.

##### 4.1 Shotcrete Walls

Typical exterior walls were reviewed for the buildings. Per the *Department of Defense Interim AT/FP Construction Standards Guidance on Structural Requirements* (see Page 3: Load Bearing Wall Systems), a width equal to two times the wall height was removed. Also at building corners, a width of wall equal to the wall height was removed in each direction.

The wall above the removal location was analyzed to determine whether it would support its self-weight as well as the weight of the slabs previously supported by the removed wall and the wall and slab systems above. The new shotcrete walls are to be constructed from 6-inch thick reinforced concrete with #5 rebar at 8-inches on center.

##### 4.2 Beams

Beams were analyzed at the exterior corridors of Buildings 355, 356, 357, and 358. For analysis purposes, the span of the beams was doubled, caused by the theoretical removal of a supporting column. These beams were determined to fail due to column removal. A new reinforced concrete beam is to be installed, Figure 12, parallel and on the inner face of the existing beam. The beams are to be 23-inches deep, 15-inches wide, with 6 - #8 rebar top and bottom of beam. All the new beams are to be continuous over supports, doveled into the existing beams and connected to the existing columns.

#### 4.3 Columns

Columns were analyzed at the exterior corridors of Buildings 355, 356, 357, and 358. The unsupported height of these columns was doubled, assuming one floor slab was disconnected from the column. These columns were determined to have sufficient capacity to support all tributary dead and live loads with the increase in column height.

#### 4.4 Windows

All windows are to meet Section B-3.1.

### 5.0 REFERENCES

1. *Department of Defense Minimum Anti-Terrorism Standards for Buildings*, UFC 4-010-01, dated 31st July, 2002.
2. *Department of Defense Interim Anti-Terrorism/Force protection Construction Standards, Guidance on Structural Requirements*, dated 5th March, 2002.

## APPENDIX

- **List of All Drawings Reviewed**
- **Figure 1: Site Plan**
- **Figure 2: Building 355 – 1<sup>st</sup> Floor**
- **Figure 3: Building 355 – 2<sup>nd</sup> & 3rd Floors**
- **Figure 4: Building 356 – 1<sup>st</sup> Floor**
- **Figure 5: Building 356 – 2nd Floor**
- **Figure 6: Building 356 – 3rd Floor**
- **Figure 7: Building 357 – 1<sup>st</sup> Floor**
- **Figure 8: Building 357 – 2<sup>nd</sup> & 3rd Floors**
- **Figure 9: Building 358 – 1<sup>st</sup> Floor**
- **Figure 10: Building 358 – 2<sup>nd</sup> & 3rd Floors**
- **Figure 11: New Shotcrete Walls**
- **Figure 12: New Support Beam**

List of All Drawings Reviewed

Sheet Name	Job #	Sheet #	Date
Administration Building	1454	1-4, 6	Feb 1917
Administration Building Floor Plans	None provided	None provided (2 sheets)	None provided
Barrack Building Floor Plans	H310	1, 2	Feb 1918
Rehabilitation of Quads Kitchen & Dining Room Floor Plans	None provided	22	Sept, 1951
Artillery Barracks Reinforcing Details	1477	7	Nov 1917
Administration Building Floor Plans	None provided	None provided	None provided
Infantry Admin Building	1454-A	None provided	Sept 1915
Administration Building	1454	101-104	Jan 1917
Administration Building 2 <sup>nd</sup> & 3 <sup>rd</sup> Floor Plans	1454	2 2	Feb 1917 Dec 1918
Barrack Building 1 <sup>st</sup> Floor Plan	None provided	None provided	None provided
Infantry Barrack Building Sections & Elevations	1478	5,6	June 1917
Administration Building Metal Work	1454	105	April 1917
Administration Building Sections & Elevations	1454	5	Mar 1917
Administration Building Floor Plans	None provided	None provided	April 1938
Administration Building Floor Plans	None provided	None provided	May 1949
Administration Building Exterior Elevations	None provided	5	April 1951
Infantry Barracks Cross Section	None provided	S738	Sept 1914
Admin. & Barrack Buildings Architectural Floor Plans	None provided	None provided (12 sheets)	None provided
Modernization of Barracks Quads C & J and Medics Area	9299 (Location Code)	Location Map: 1 Title Sheets: 1-3 Symbols/References: 4 Site Plan/Utilities: 1,2 Electrical Site Plan: 1 Arch: 1-4, 7-9, 11-28	Dec 1973
U.S. Army Engineer Division Design Branch	9299 (Location Code)	T1-T2, C1, A1-17, S1-6	June 2001

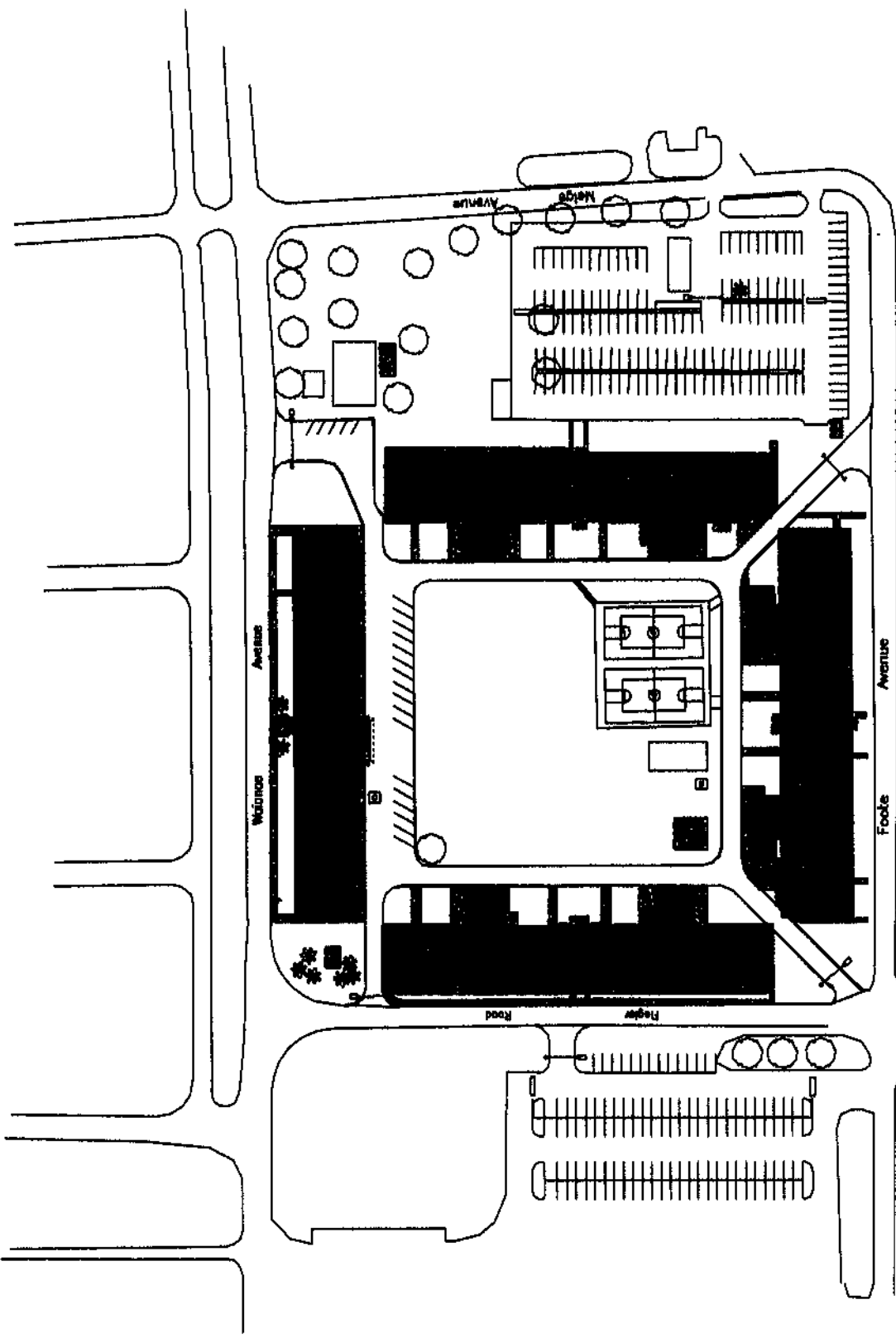
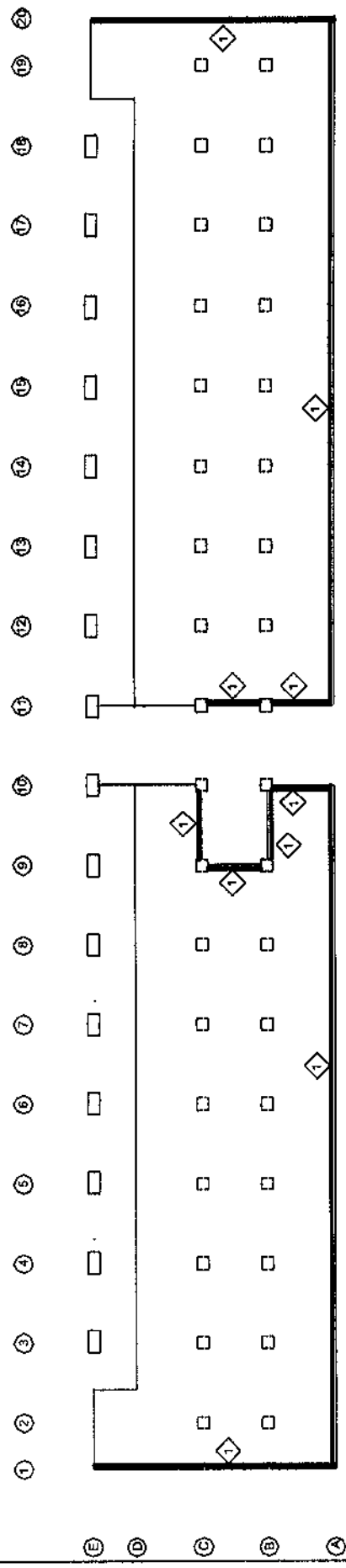


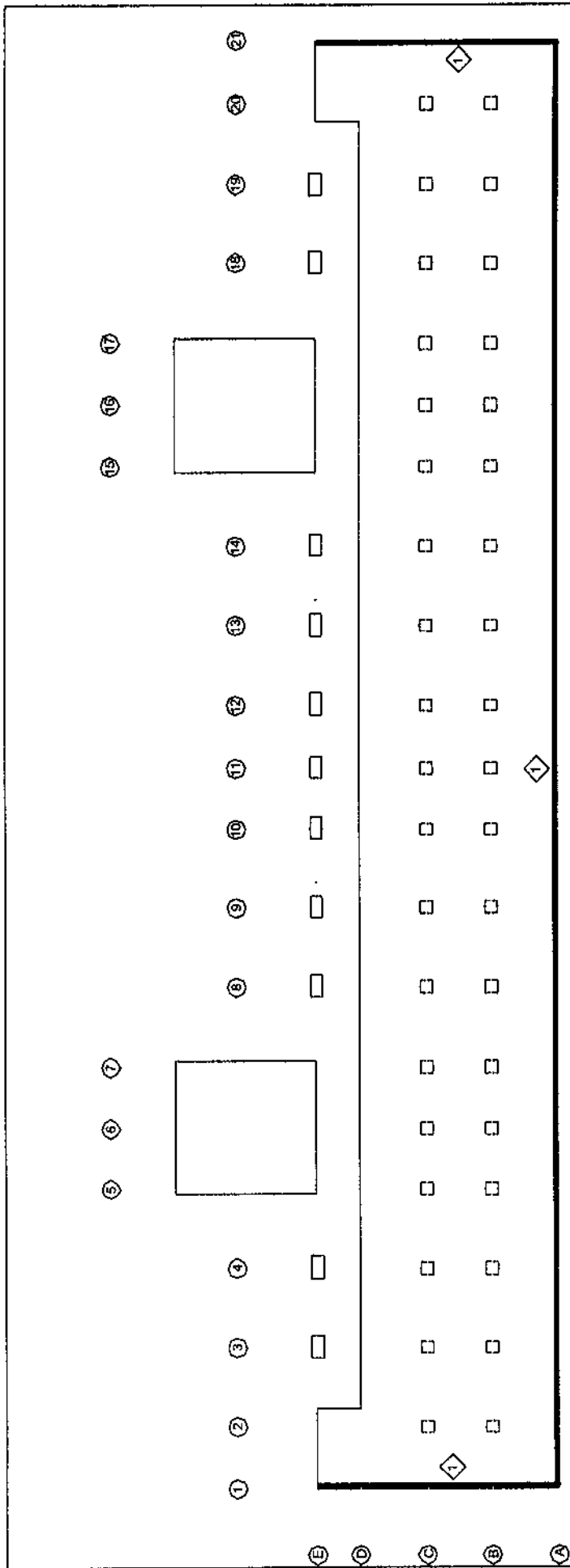
Figure 1: Site Plan



RETROFIT UPGRADES		
DESIGNATION	DESCRIPTION	DESIGNATION
1	6" SHOTCRETE WALL	

Figure 2: Building 355 - 1st Floor



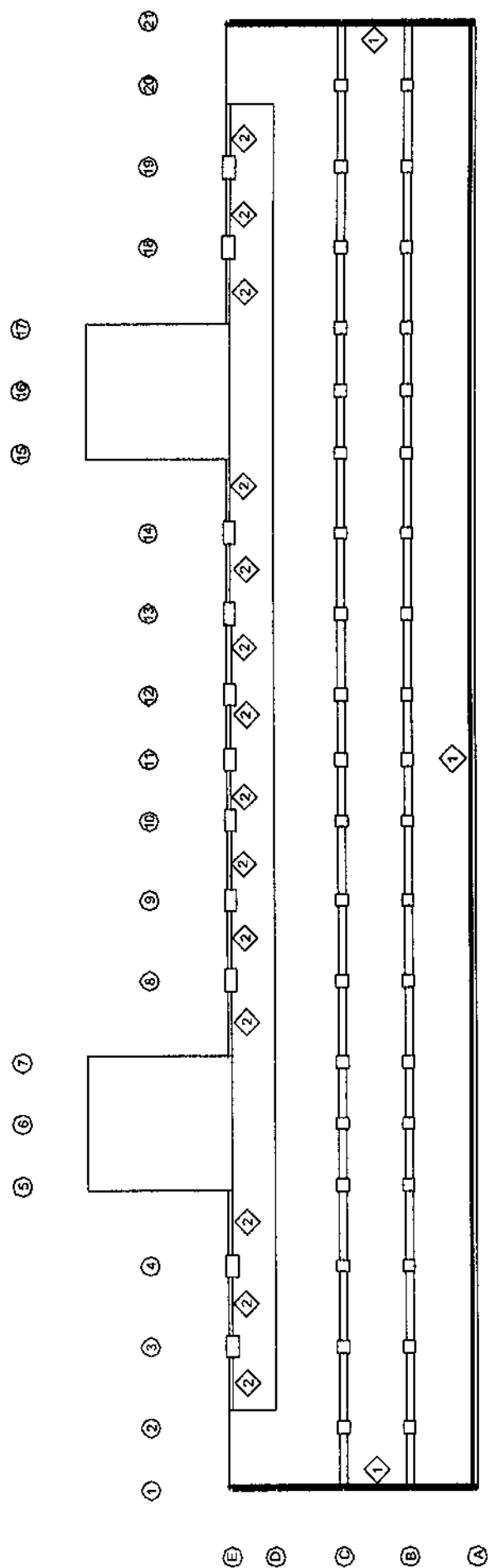


RETROFIT UPGRADES		
DESIGNATION	DESCRIPTION	DESIGNATION
1	6" SHOTCRETE WALL	

Figure 4: Building 356 - 1st Floor





[illegible]

**Figure 6: Building 356 - 3rd Floor**

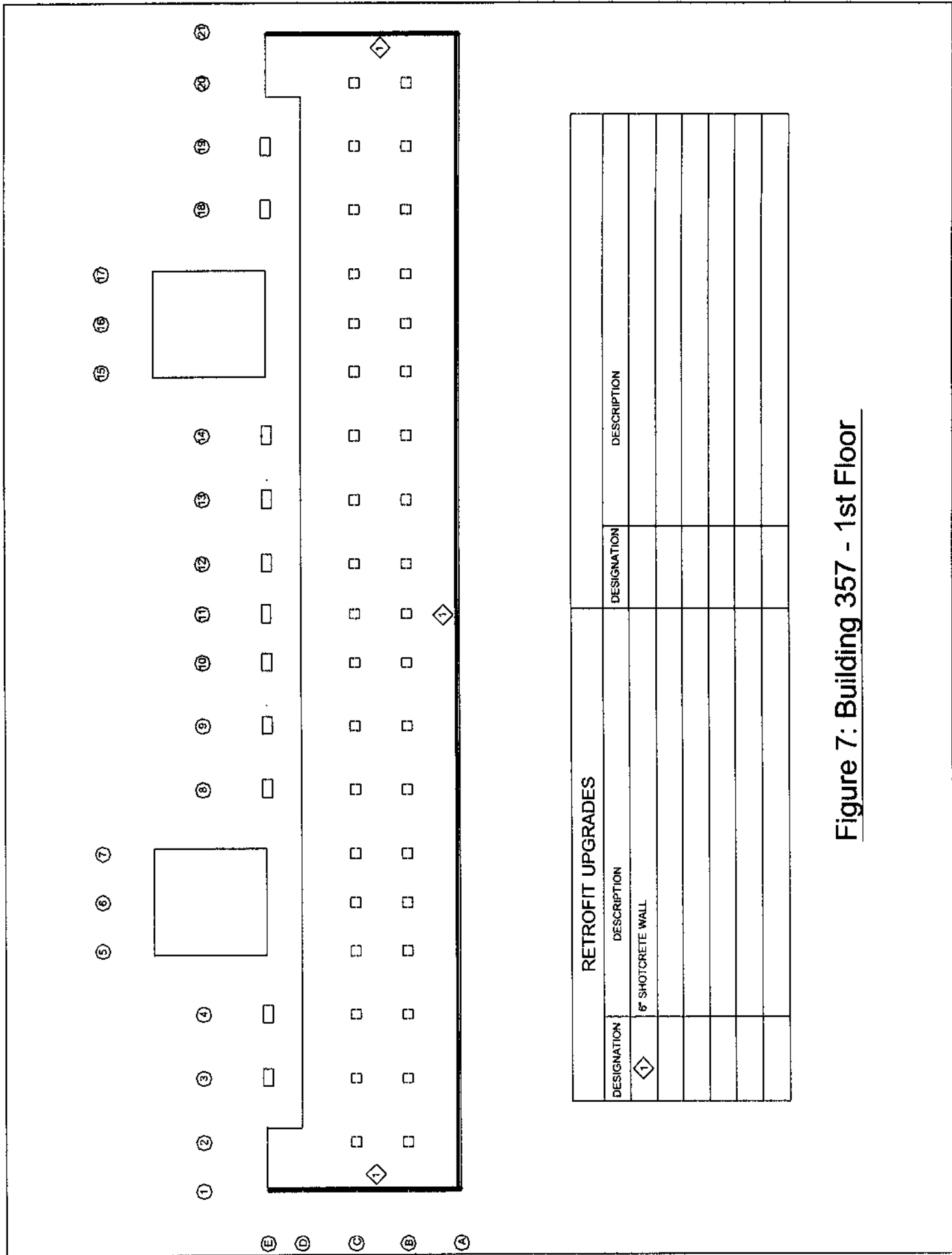
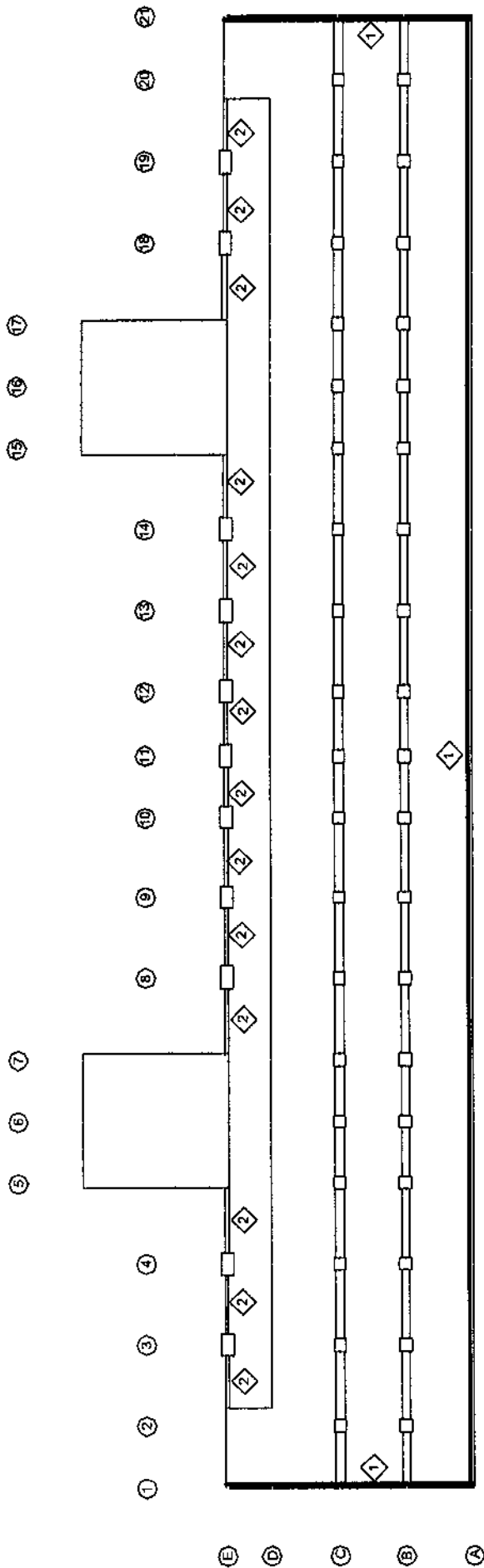
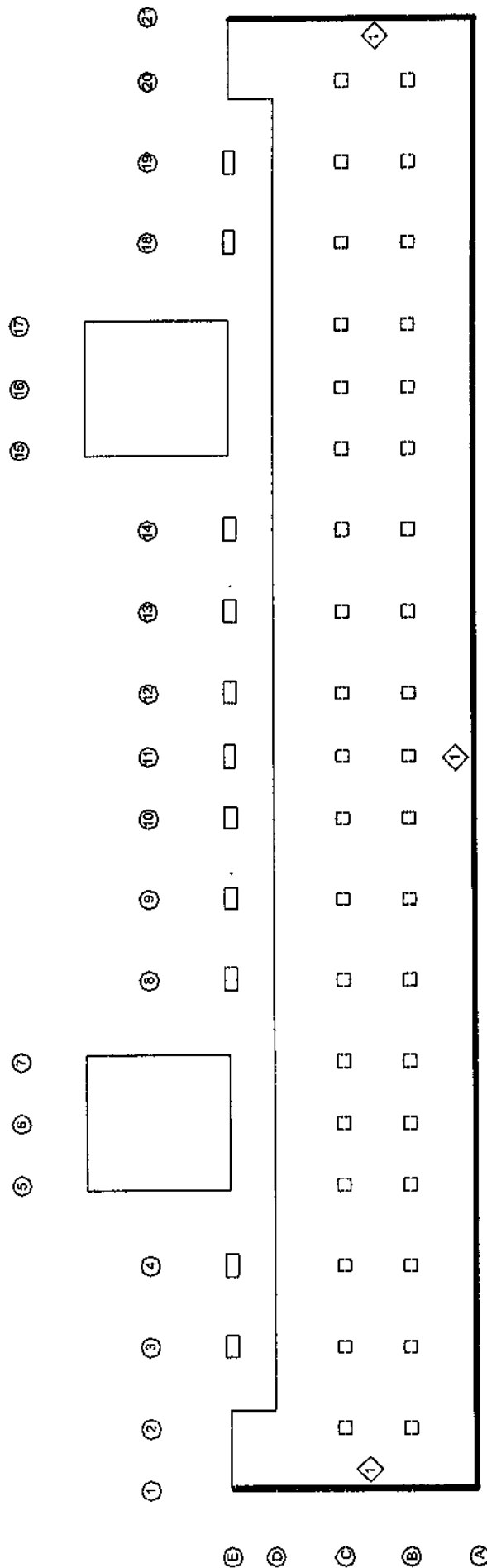


Figure 7: Building 357 - 1st Floor



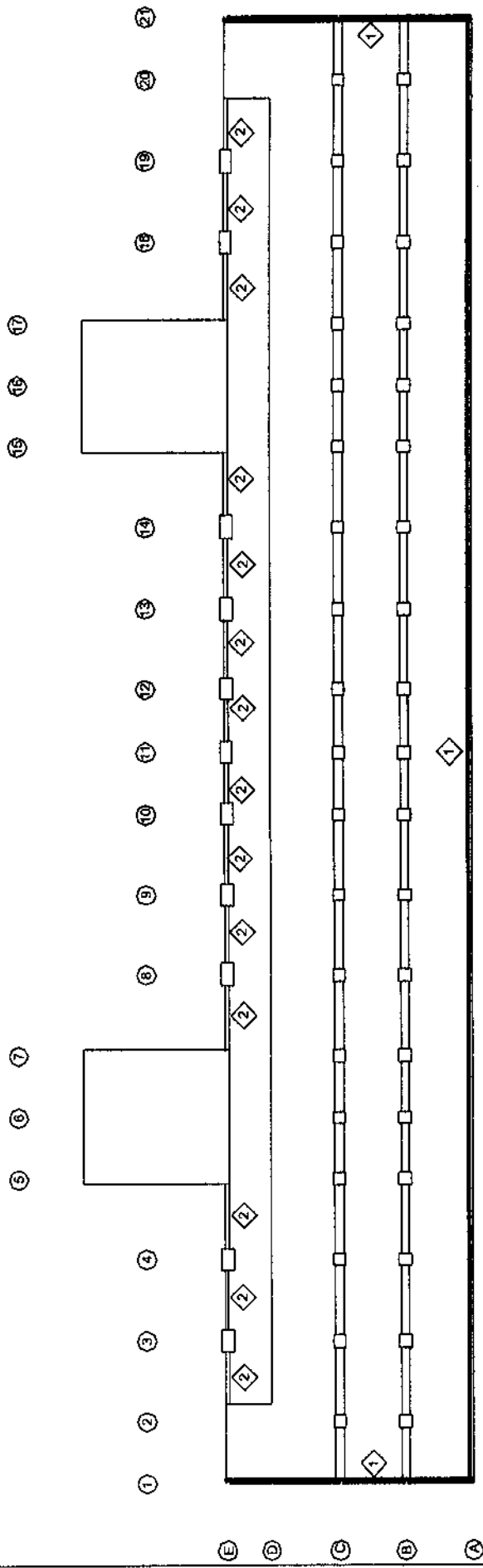
RETROFIT UPGRADES		
DESIGNATION	DESCRIPTION	DESIGNATION
1	6" SHOTCRETE WALL	
2	NEW CONCRETE BEAM ON INSIDE FACE OF EXISTING CORRIDOR BEAM	

Figure 8: Building 357 - 2nd & 3rd Floors



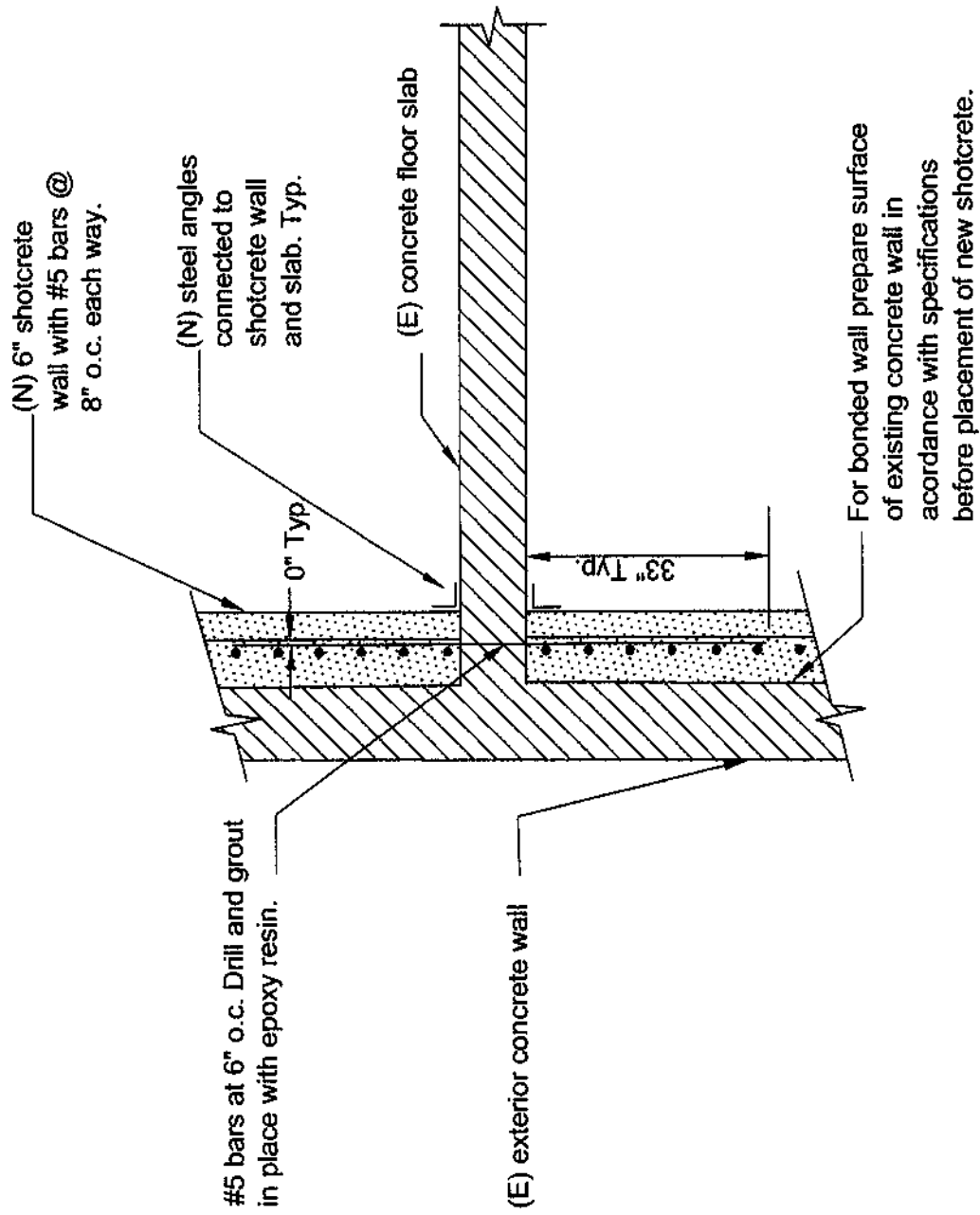
RETROFIT UPGRADES		
DESIGNATION	DESCRIPTION	DESIGNATION
1	6" SHOTCRETE WALL	

Figure 9: Building 358 - 1st Floor

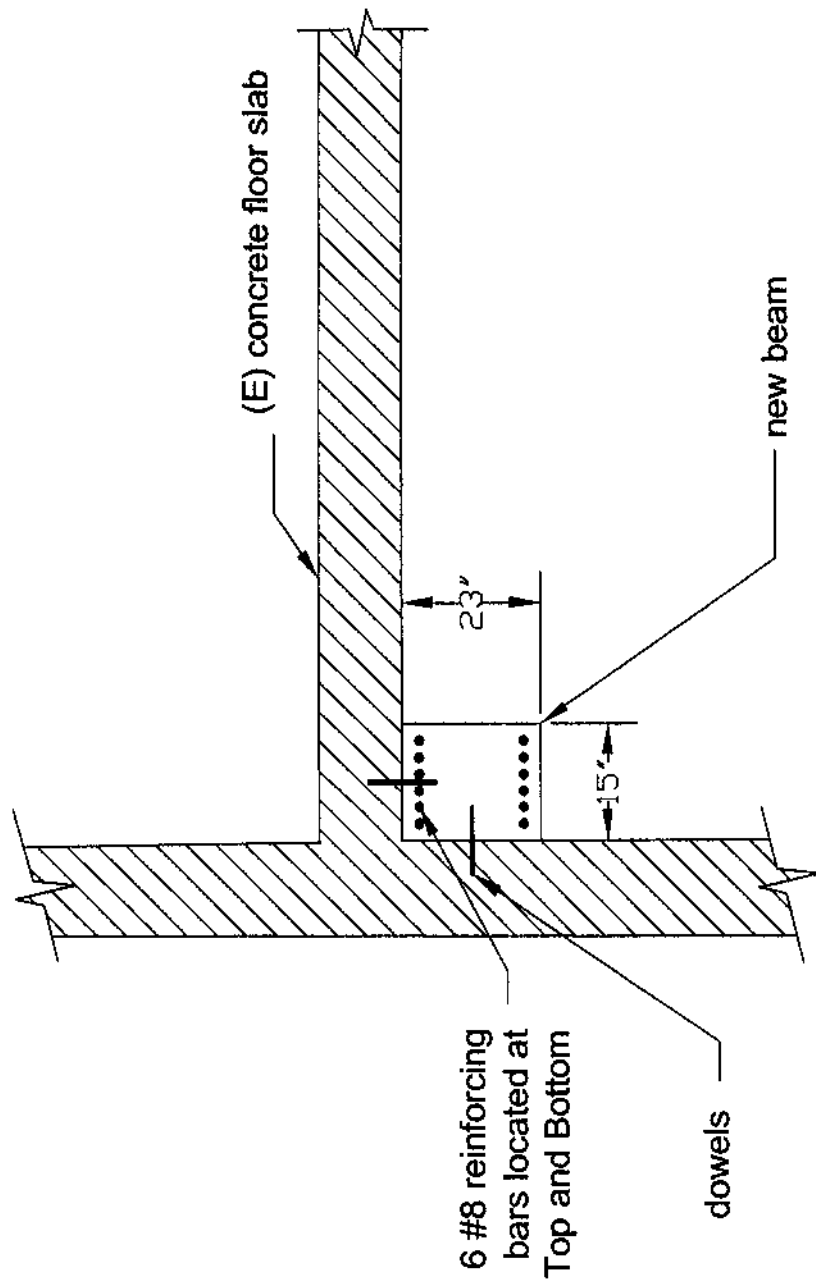


RETROFIT UPGRADES		
DESIGNATION	DESCRIPTION	DESIGNATION
1	6" SHOTCRETE WALL	
2	NEW CONCRETE BEAM ON INSIDE FACE OF EXISTING CORRIDOR BEAM	

Figure 10: Building 358 - 2nd & 3rd Floors



**Figure 11: New Shotcrete Walls**



**Figure 12: New Support Beam**



## **BUILDING CALCULATIONS**

### **PROGRESSIVE COLLAPSE EXISTING CONDITIONS**

Exterior corridor beam spanning 40 feet .....	1
Exterior corridor column with unbraced length of 25.2 feet .....	4
Exterior concrete wall spanning 25 feet .....	6

### **PROGRESSIVE COLLAPSE UPGRADES**

Exterior corridor beam with new concrete beam spanning 40 feet .....	22
Exterior concrete wall with new 6" shotcrete wall spanning 25 feet .....	26

Schofield Barracks  
Building 355 - Progressive Collapse  
Existing Exterior Beam 3rd Floor - No Good  
(Beam supports 3rd floor and roof loads)

psi := lb·in<sup>-2</sup>  
psf := lb·ft<sup>-2</sup>  
msec := 10<sup>-3</sup>·sec

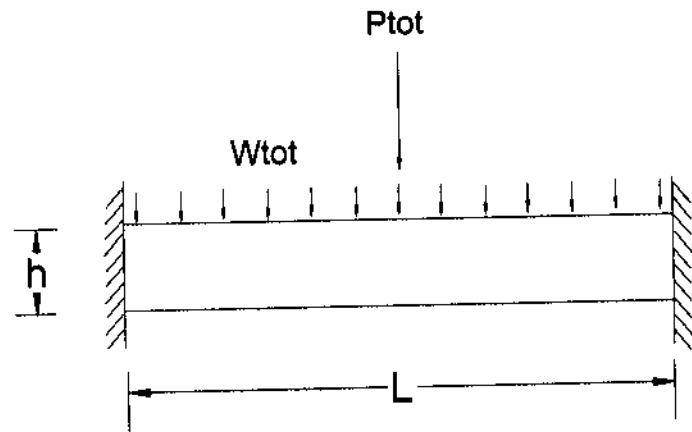
Beam Length (wo col) L := 36·ft  
Beam Depth (total) h := 27·in  
Beam Width b := 6·in  
Cover Depth c := 1.125·in  
Slab Thickness t := 4·in  
Tension Rebar Diameter db := 0.75·in  
Number of Positive Tension Bars np := 3  
Number of Negative Tension Bars nn := 1

Concrete Comp. Strength fc := 2500·psi  
Steel Yield Strength fy := 40000·psi  
Steel Elastic Modulus Es := 29000000·psi  
Reinf. Concrete Wt. Density γc := 150·lb·ft<sup>-3</sup>  
Conc. Elastic Modulus Ec := 57000·√fc·lb·in<sup>-2</sup>  
Ec = 3 × 10<sup>6</sup> psi

Column Depth hc := 10·in  
Column Width bc := 48·in  
Column Length (removed at 1st floor) Lc := 12.5·ft

Shear Reinforcement Dia. dv := 0.25·in

Slab Tributary Length s1 := 20·ft  
Slab Tributary Width s2 := 5.83·ft  
Roof Dead Load DLr := 20·psf  
Floor Live load LLf := 100·psf  
Roof Live Load LLr := 20·psf  
Roof Girder Depth hg := 10·in  
Roof Girder Width wg := 10·in  
Parapet Height hp := 4.7·ft  
Parapet Width wp := 6·in



## MATERIAL STRENGTHS

Steel Increase Factor IFs := 1.1  
Concrete Increase Factor IFc := 1.1  
Steel Yield Strength fdy := IFs·fy  
Concrete Comp. Strength fdc := IFc·fc

(DoD Interim ATFP Construction Standards -  
Guidance on Structural Requirements, 3/5/01)

fdy = 44000 lb·in<sup>-2</sup>  
fdc = 2750 lb·in<sup>-2</sup>

## Point load at midspan of beam

Weight of column at 3rd floor:

Wcol = 6250 lb

Weight of Roof wall

Wwall = 7050 lb

Weight of Roof



Total Midspan Moment demand

$$M_{tot} = 256587 \text{ lb ft}$$

$$M_{tot} > M_u \quad \text{No Good}$$

## AT SUPPORTS:

Tension Steel Area

$$A_{stg} = 0.44 \text{ in}^2$$

Ultimate Moment Capacity at Supports

$$M_{ug} = 38067 \text{ lb ft}$$

(Since capacity fails at midspan, do not need to check moment at supports.)

Ductility and Rotation

Gross Mom. of Inertia

$$I_g = 9841 \text{ in}^4$$

Elastic Stiffness

$$K_e = 801562 \frac{\text{lb}}{\text{ft}}$$

Ultimate Resistance

$$R_u = 16919 \text{ lb}$$

Steel Percentage

$$\rho = 0.009$$

Modular Ratio

$$n = 10$$

Neutral Axis of  
Transformed Section

$$k_d = 9 \text{ in}$$

Cracked Mom. of Inertia

$$I_c = 5011 \text{ in}^4$$

Avg. Mom. of Inertia

$$I_a = 7426 \text{ in}^4$$

Total Force

$$P = 46552 \text{ lb}$$

Equivalent Ductility

$$\mu = -0.29$$

Ductility less than 0. Total force greater than  $R_u$ . No Good

Schofield Barracks  
Building 355 - Progressive Collapse  
Corridor Column - Unbraced Length **OK**

vc

psf := lb·ft<sup>-2</sup>

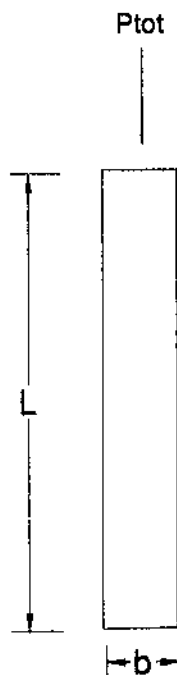
psi := lb·in<sup>-2</sup>

Column Depth	h := 10·in	Conc. Comp. Strength	fc := 2500·psi
Column Width	b := 48·in	Steel Yield Strength	fy := 40000·psi
Floor to Floor Height	h <sub>ff</sub> := 12.58·ft	Steel Modulus of Elast.	Es := 29000000·psi
Unbraced Length	L := 2·h <sub>ff</sub>	Conc. Mass Density	γ <sub>c</sub> := 150·lb·ft <sup>-3</sup>
No. of Bars ea. side	n := 3	Conc. Elastic Modulus	E <sub>c</sub> := 57000·√fc·lb·in <sup>-2</sup>
Shear Ties Diameter	dt := 0.375·in		E <sub>c</sub> = 2.85 × 10 <sup>6</sup> psi
Tie Spacing	st := 24·in		
Concrete Cover	c := 1.5·in	Reinforcing Bars Diameter	db := 0.375·in
		Number of Floors Above	n <sub>f</sub> := 2

Beam Depth	h <sub>g</sub> := 27·in
Beam Width	w <sub>g</sub> := 6·in
Wall Depth	h <sub>w</sub> := 68·in
Wall Width	w <sub>w</sub> := 6·in

Slab Length	s <sub>1</sub> := 20·ft
Slab Effective Width	s <sub>2</sub> := 5.4·ft
Slab thickness	ts := 4·in

Roof Dead Load	DL <sub>r</sub> := 20·psf	(conservative)
Floor Live Load	LL <sub>f</sub> := 100·psf	
Roof Live Load	LL <sub>r</sub> := 20·psf	



**MATERIAL STRENGTHS**

Concrete Increase Factor	IF <sub>c</sub> := 1.1
Steel. Increase Factor	IF <sub>s</sub> := 1.1
Concrete Comp. Strength	fdc := IF <sub>c</sub> ·fc
Steel Yield Strength	fdy := IF <sub>s</sub> ·fy

(from DoD Interim AT/FP Construction Standards, Guidance on Structural Requirements, March 5, 2001)

fdc = 2750 psi
fdy = 44000 psi

D

Building Loads

Weight of Columns Above	$W_{col} = 6290 \text{ lb}$
Weight of Wall Above	$W_{wall} = 8500 \text{ lb}$
Weight of Roof	$W_{roof} = 2160 \text{ lb}$
Weight of Slabs:	$W_{slabs} = 10800 \text{ lb}$
Weight of Beams	$W_{beams} = 6750 \text{ lb}$
Self Weight of Column	$W_{self} = 12580 \text{ lb}$
Weight Dead Load	$W_{dl} = 47080 \text{ lb}$
Weight Live Load	$W_{ll} = 11880 \text{ lb}$
Total Tributary Weight	$P_{total} = 58960 \text{ lb}$
Area of Steel	$A_s = 0.33 \text{ in}^2$
Tension Steel Centroid	$y_t = 2.06 \text{ in}$
Effective Depths	$d = 7.94 \text{ in}$ $d_e = 5.87 \text{ in}$
Gross Mom. of Inertia	$I_g = 4000 \text{ in}^4$
Steel Percentage	$\rho = 0.001$
Modular Ratio	$n = 10.18$
Neutral Axis of Transformed Section	$k d = 1.05 \text{ in}$
Cracked Mom. of Inertia	$I_c = 181.58 \text{ in}^4$
Avg. Mom. of Inertia	$I_a = 2090.79 \text{ in}^4$
Concrete Compressive Capacity	$P_c = 1.12 \times 10^6 \text{ lb}$
Buckling Capacity Load	$> P_{total} = 5.9 \times 10^4 \text{ lb} \quad \text{OK}$ $P_b = 6.45 \times 10^5 \text{ lb}$ $> P_{total} = 5.9 \times 10^4 \text{ lb} \quad \text{OK}$

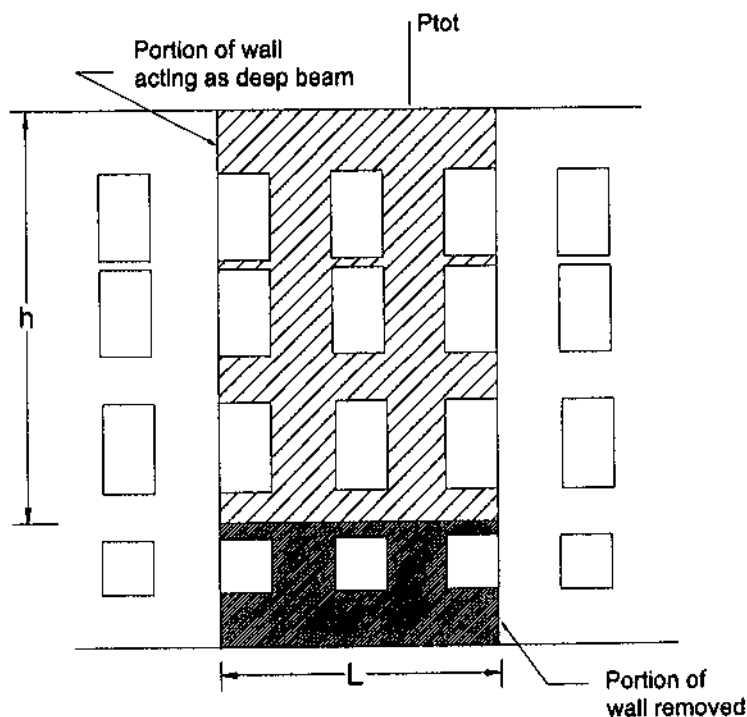
**Schofield Barracks  
Building 355 - Progressive Collapse  
Deep Beam at High Roof - No Good  
(25' length of exterior wall removed at 1st floor)**

VC

psi := lb·in<sup>-2</sup>    psf := lb·ft<sup>-2</sup>

Beam Length (wo col)     $L := 25\text{-ft}$   
 Beam Depth (total)     $h := 39.58\text{-ft}$   
 Beam Width     $b := 8\text{-in}$   
 Cover Depth     $c := 1.125\text{-in}$   
 Slab Thickness     $t := 6\text{-in}$   
 Tension Rebar Diameter     $db := 0.375\text{-in}$   
 Number of Tension Bars     $np := 2$   
 Roof Dead Load     $DLr := 20\text{-psf}$   
 Floor Live Load     $LL := 100\text{-psf}$   
 Roof Live Load     $LLr := 20\text{-psf}$   
 Roof Tributary Width     $r1 := 20\text{-ft}$   
 Roof Tributary Length     $r2 := 30.42\text{-ft}$   
 Slab Tributary Width     $s1 := 20\text{-ft}$   
 Slab Tributary Length     $s2 := 8.42\text{-ft}$   
 Number of Floors Above     $nf := 2$

Concrete Comp. Strength     $fc := 2500\text{-psi}$   
 Steel Yield Strength     $fy := 40000\text{-psi}$   
 Steel Elastic Modulus     $Es := 29000000\text{-psi}$   
 Reinf. Concrete Wt. Density     $\gamma_c := 150\text{-lb}\cdot\text{ft}^{-3}$   
 Shear Reinforcement Dia.     $dv := 0.25\text{-in}$   
 Conc. Elastic Modulus     $Ec := 57000\sqrt{fc}\text{-lb}\cdot\text{in}^{-2}$   
     $Ec = 3 \times 10^6\text{-psi}$



**MATERIAL STRENGTHS**

Steel Increase Factor     $IFs := 1.1$   
 Concrete Increase Factor     $IFc := 1.1$   
 Steel Yield Strength     $fdy := IFs \cdot fy$   
 Concrete Comp. Strength     $fdc := IFc \cdot fc$

(DoD Interim ATFP Construction Standards -  
Guidance on Structural Requirements, 3/5/01)

$fdy = 44000\text{-lb}\cdot\text{in}^{-2}$   
 $fdc = 2750\text{-lb}\cdot\text{in}^{-2}$

Point load on beam

Weight of Roof Load

$$Wdl = 3915 \frac{\text{lb}}{\text{ft}}$$

Weight Roof Live Load

$$Wll = 842 \frac{\text{lb}}{\text{ft}}$$

Sum of Point Loads

$$Psum = 18252 \text{ lb}$$

Impact Factor

$$IF := 2$$

Total Point Load

$$Ptot = 36504 \text{ lb}$$

Distributed load along span of beam

Weight of Slab at 3rd and 2nd floors:

$$Wslab = 1263 \frac{\text{lb}}{\text{ft}}$$

Self Weight of Deep Beam

(assume 1/3 of wall area is windows)

$$Wself = 2652 \frac{\text{lb}}{\text{ft}}$$

Weight Dead Load

$$Wdl = 3915 \frac{\text{lb}}{\text{ft}}$$

Weight of Live Load at 2 floors

$$Wll = 842 \frac{\text{lb}}{\text{ft}}$$

Sum of Distributed Load

$$Wsum = 4757 \frac{\text{lb}}{\text{ft}}$$

Impact Factor

$$IF := 2$$

Total Distributed Load

$$Wtot = 9514 \frac{\text{lb}}{\text{ft}}$$

## AVERAGE MOMENT OF INERTIA

Area of Tension Steel Bar

$$Ab = 0.11 \text{ in}^2$$

Area of Tension Steel

$$As = 0.221 \text{ in}^2$$

Effective Depths

$$yt = 1.56 \text{ in}$$

$$d = 473 \text{ in}$$

Beam Moment Check

Tension Steel Force

$$T = 9719 \text{ lb}$$

Concrete Force (compression)

$$Cc = 9719 \text{ lb}$$

Estimate compression block depth

$$a = 0.52 \text{ in}$$

Ultimate Moment Capacity

$$M_u = 383214 \text{ lb ft}$$

Moment due to Point Load

$$M_p = 80491 \text{ lb ft}$$

Moment due to Distributed Load

$$M_w = 247753 \text{ lb ft}$$

Total Moment Demand

$$M_{\text{tot}} = 328244 \text{ lb ft}$$

$$M_{\text{tot}} < M_u \quad \text{OK}$$

Moment at ends are larger, but since beam does not have the shear capacity (see below), there is no need to check end moments.

Beam Shear Check

Depth of beam for shear

$$d_v = 11.25 \text{ ft}$$

(concrete below window will be removed)

Beam Shear Capacity

$$V_c = 113269 \text{ lb}$$

Shear due to Point load

$$V_p = 28619 \text{ lb}$$

Shear due to Distributed load

$$V_d = 118921 \text{ lb}$$

Total Shear Demand

$$V_{\text{tot}} = 147541 \text{ lb}$$

$$V_{\text{tot}} > \phi V_c \quad \text{No Good}$$

Ductility and Rotation

Gross Mom. of Inertia

$$I_g = 7 \times 10^7 \text{ in}^4$$

Elastic Stiffness

$$K_e = 2 \times 10^{10} \frac{\text{lb}}{\text{ft}}$$

Moment Capacity at Midspan

Moment Capacity at Supports

Ultimate Resistance

$$R_u = 122628 \text{ lb}$$

Steel Percentage

$$\rho = 0$$



Modular Ratio

$$n = 10$$

Neutral Axis of  
Transformed Section

$$kd = 16 \text{ in}$$

Cracked Mom. of Inertia

$$I_c = 481584 \text{ in}^4$$

Avg. Mom. of Inertia

$$I_a = 4 \times 10^7 \text{ in}^4$$

Total Force

$$P = 137173 \text{ lb}$$

Equivalent Ductility

$$\mu = -4.22$$

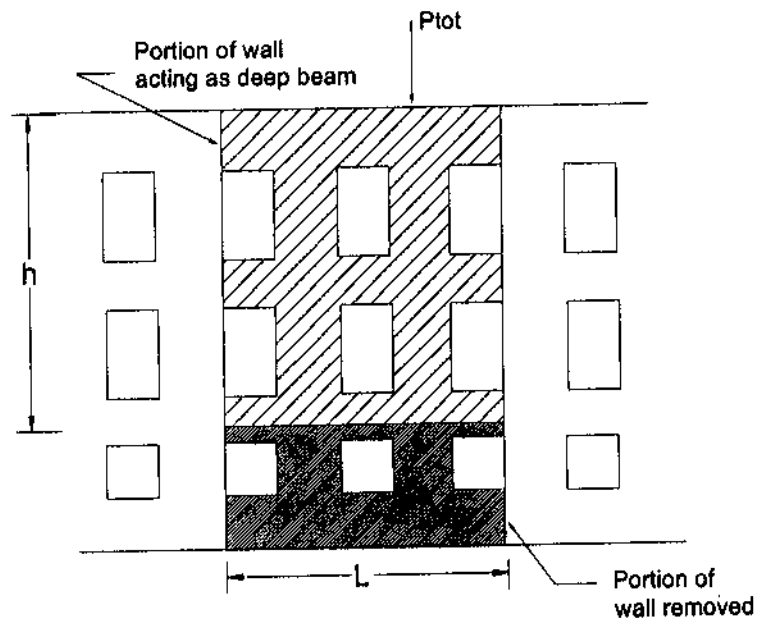
Ductility less than 0. Total force  
greater than  $R_u$ . No Good

**Schofield Barracks  
Building 355 - Progressive Collapse  
Deep Beam at Low Roof - No Good**  
(25' length of exterior wall removed at 1st floor)

psi := lb·in<sup>-2</sup> VC  
psf := lb·ft<sup>-2</sup>

Beam Length (wo col) L := 25·ft  
Beam Depth (total) h := 29·ft  
Beam Width b := 8·in  
Cover Depth c := 1.125·in  
Slab Thickness t := 6·in  
Tension Rebar Diameter db := 0.375·in  
Number of Tension Bars np := 2  
  
Roof Dead Load DLr := 20·psf  
Floor Live Load LL := 100·psf  
Roof Live Load LLr := 20·psf  
Roof Tributary Width r1 := 20·ft  
Roof Tributary Length r2 := 8.42·ft  
Slab Tributary Width s1 := 20·ft  
Slab Tributary Length s2 := 8.42·ft  
Roof Girder Depth hg := 10·in  
Roof Girder Width wg := 10·in  
Number of Floors Above nf := 2

Concrete Comp. Strength fc := 2500·psi  
Steel Yield Strength fy := 40000·psi  
Steel Elastic Modulus Es := 29000000·psi  
Reinf. Concrete Wt. Density yc := 150·lb·ft<sup>-3</sup>  
Shear Reinforcement dv := 0.25·in  
Conc. Elastic Modulus Ec := 57000·√fc·lb·in<sup>-2</sup>  
Ec = 3 × 10<sup>6</sup> psi



**MATERIAL STRENGTHS**

Steel Increase Factor IFs := 1.1  
Concrete Increase Factor IFc := 1.1  
Steel Yield Strength fdy := IFs·fy  
Concrete Comp. Strength fdc := IFc·fc

(DoD Interim ATFP Construction Standards -  
Guidance on Structural Requirements, 3/5/01)

fdy = 44000 lb·in<sup>-2</sup>  
fdc = 2750 lb·in<sup>-2</sup>



Ultimate Moment Capacity  $M_u = 280384 \text{ lb ft}$

Moment due to Point Load  
(at midspan)  $M_p = 26147 \text{ lb ft}$

Moment due to Distributed Load  
(at midspan)  $M_w = 210833 \text{ lb ft}$

Total Moment Demand  $M_{tot} = 236981 \text{ lb ft}$

$M_{tot} < M_u$  OK

Moment at ends are larger, but since beam does not have the shear capacity (see below), there is no need to check end moments.

#### Beam Shear Check

Depth of beam for shear  $d_v = 8.87 \text{ ft}$   
(concrete below window will be removed)

Beam Shear Capacity  $V_c = 89306 \text{ lb}$

Shear due to Point load  $V_p = 9297 \text{ lb}$

Shear due to Distributed load  $V_d = 101200 \text{ lb}$

Total Shear Demand  $V_{tot} = 110497 \text{ lb}$

$V_{tot} > V_c$  No Good

#### Ductility and Rotation

Gross Mom. of Inertia  $I_g = 3 \times 10^7 \text{ in}^4$

Elastic Stiffness  $K_e = 7 \times 10^9 \frac{\text{lb}}{\text{ft}}$

Moment Capacity at Midspan

Moment Capacity at Supports

Ultimate Resistance  $R_u = 89723 \text{ lb}$

Steel Percentage  $\rho = 0$



Modular Ratio  $n = 10$

Neutral Axis of Transformed Section  $k_d = 13 \text{ in}$

Cracked Mom. of Inertia  $I_c = 256000 \text{ in}^4$

Avg. Mom. of Inertia  $I_a = 1 \times 10^7 \text{ in}^4$

Total Force  $P = 107129 \text{ lb}$

Equivalent Ductility  $\mu = -2.58$  Ductility less than 0. Total force greater than  $R_u$ . No Good

**Schofield Barracks**  
**Building 355 - Progressive Collapse**  
**Deep Cantilever Beam at Low Roof -OK**  
 (12.5' length of exterior wall removed at corner of 1st floor)

psi := lb·in<sup>-2</sup>

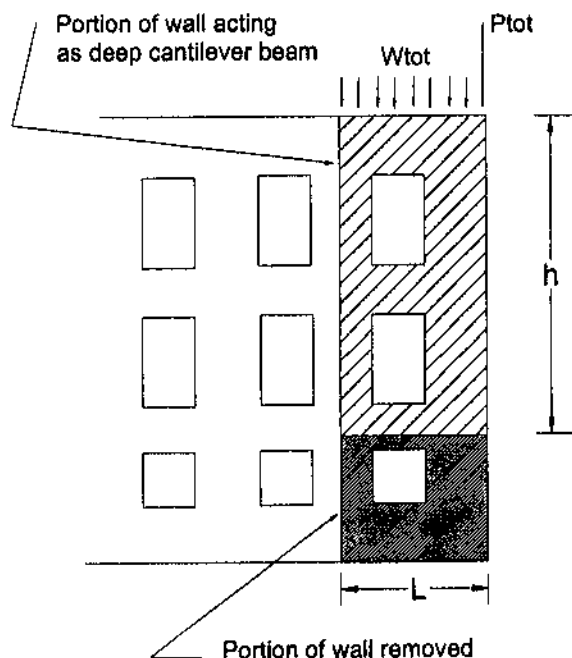
VC

psf := lb·ft<sup>-2</sup>

Beam Length (wo col)      L := 12.5·ft  
 Beam Depth (total)      h := 29.25·ft  
 Beam Width              b := 8·in  
 Cover Depth              c := 1.125·in  
 Slab Thickness            t := 6·in  
 Tension Rebar Diameter    db := 0.5·in  
 Number of Negative Bars    np := 4

Concrete Comp. Strength    fc := 2500·psi  
 Steel Yield Strength        fy := 40000·psi  
 Steel Elastic Modulus      Es := 29000000·psi  
 Reinf. Concrete Wt. Density    γc := 150·lb·ft<sup>-3</sup>  
 Shear Reinforcement        dv := 0.25·in  
 Conc. Elastic Modulus      Ec := 57000·√fc·lb·in<sup>-2</sup>  
                                      Ec = 3 × 10<sup>6</sup> psi

Roof Dead Load            DLR := 20·psf  
 Floor Live Load            LL := 100·psf  
 Roof Live Load            LLr := 20·psf  
 Roof Tributary Width        r1 := 10·ft  
 Roof Tributary Length       r2 := 8.42·ft  
 Slab Tributary Width        s1 := 10·ft  
 Slab Tributary Length       s2 := 8.42·ft  
 Roof Girder Depth          hg := 10·in  
 Roof Girder Width          wg := 10·in  
 Number of Floors Above    nf := 2



**MATERIAL STRENGTHS**

Steel Increase Factor      IFs := 1.1  
 Concrete Increase Factor    IFc := 1.1  
 Steel Yield Strength        fdy := IFs·fy  
 Concrete Comp. Strength    fdc := IFc·fc

(DoD Interim ATFP Construction Standards -  
 Guidance on Structural Requirements, 3/5/01)

fdy = 44000 lb·in<sup>-2</sup>  
 fdc = 2750 lb·in<sup>-2</sup>

Point loads on beam

Weight of Roof Load	$W_{\text{roof}} = 1684 \text{ lb}$
Weight of Roof Live Load	$W_{\text{ll}} = 842 \frac{\text{lb}}{\text{ft}}$
Weight of Roof girder	$W_{\text{gird}} = 877 \text{ lb}$
Sum of Point Loads	$P_{\text{sum}} = 3403 \text{ lb}$
Impact Factor	$IF = 2$
Total Point Load	$P_{\text{tot}} = 6806 \text{ lb}$

Distributed load along span of beam

Weight of Slab at 3rd and 2nd floors:	$W_{\text{slab}} = 1263 \frac{\text{lb}}{\text{ft}}$
Self Weight of Deep Beam (assume 1/3 of wall area is windows)	$W_{\text{self}} = 1960 \frac{\text{lb}}{\text{ft}}$
Weight Dead Load	$W_{\text{dl}} = 3223 \frac{\text{lb}}{\text{ft}}$
Weight of Live Load at 2 floors	$W_{\text{ll}} = 842 \frac{\text{lb}}{\text{ft}}$
Sum of Distributed Load	$W_{\text{sum}} = 4065 \frac{\text{lb}}{\text{ft}}$
Impact Factor	$IF = 2$
Total Distributed Load	$W_{\text{tot}} = 8129 \frac{\text{lb}}{\text{ft}}$

## AVERAGE MOMENT OF INERTIA

Area of Tension Steel Bar	$A_b = 0.196 \text{ in}^2$
Area of Tension Steel	$A_s = 0.785 \text{ in}^2$
Effective Depths	$y_t = 1.62 \text{ in}$
	$d = 349 \text{ in}$

Beam Moment Check

Tension Steel Force	$T = 34558 \text{ lb}$
Concrete Force (compression)	$C_c = 34558 \text{ lb}$
Estimate compression block depth	$a = 1.85 \text{ in}$
Ultimate Moment Capacity	$M_u = 1003467 \text{ lb ft}$

Moment due to Point Load

$$M_p = 85077 \text{ lb ft}$$

Moment due to Distributed Load

$$M_w = 635117 \text{ lb ft}$$

Total Moment Demand

$$M_{tot} = 720194 \text{ lb ft}$$

$$M_{tot} < M_u \quad \text{OK}$$

### Beam Shear Check

At Windows: (concrete below window will be removed)

Depth of beam for shear

$$d_v = 29.11 \text{ ft}$$

Beam Shear Capacity

$$V_c = 293142 \text{ lb}$$

$$V_s = 4312 \text{ lb}$$

(A' beam: 24 in deep, with 1/4" stirrups at 12"o.c.)

$$V = 297454 \text{ lb}$$

Shear due to Point load

$$V_p = 6806 \text{ lb}$$

Shear due to Distributed load

$$V_d = 101619 \text{ lb}$$

Total Shear Demand

$$V_{tot} = 108425 \text{ lb}$$

$$V_{tot} < V \quad \text{OK}$$

At Fixed end of Deep Cantilever Beam:

Depth of beam for shear

$$d_v = 29.11 \text{ ft}$$

Beam Shear Capacity

$$V_c = 293142 \text{ lb}$$

$$V_s = 4312 \text{ lb}$$

(A' beam: 24 in deep, with 1/4" stirrups at 12"o.c.)

$$V = 297454 \text{ lb}$$

Shear due to Point load

$$V_p = 6806 \text{ lb}$$

Shear due to Distributed load

$$V_d = 101619 \text{ lb}$$

Total Shear Demand

$$V_{tot} = 108425 \text{ lb}$$

$$V_{tot} < V \quad \text{OK}$$

### Ductility and Rotation

Gross Mom. of Inertia

$$I_g = 3 \times 10^7 \text{ in}^4$$

Elastic Stiffness

$$K_e = 9 \times 10^8 \frac{\text{lb}}{\text{ft}}$$

Ultimate Resistance

$$R_u = 80277 \text{ lb}$$

Steel Percentage

$$\rho = 0$$

Modular Ratio

$$n = 10$$

Neutral Axis of  
Transformed Section

$$k_d = 25 \text{ in}$$

Cracked Mom. of Inertia

$$I_c = 886464 \text{ in}^4$$

Avg. Mom. of Inertia

$$I_a = 1 \times 10^7 \text{ in}^4$$

Total Force

$$P = 54212 \text{ lb}$$

Equivalent Ductility

$$\mu = 1.54$$

Elastic Limit Displacement

$$X_e = 0.0011 \text{ in}$$

Peak Displacement

$$X_m = 0.00169 \text{ in}$$

Support Rotation

$$\theta = 0.00129 \text{ deg} \quad < 6 \text{ deg. OK}$$

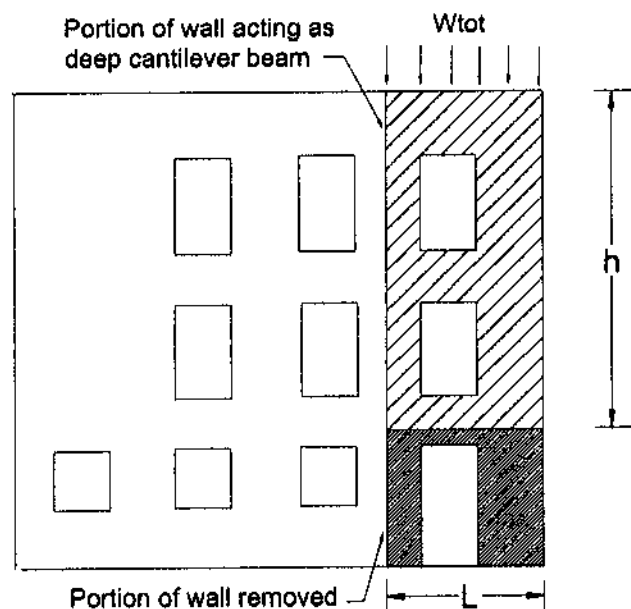


**Schofield Barracks**  
**Building 355 - Progressive Collapse**  
**Deep Cantilever Beam at Short Side - OK**  
 (12.5' length of exterior wall removed at corner of 1st floor)

psi := lb·in<sup>-2</sup> VC  
 psf := lb·ft<sup>-2</sup>

Beam Length (wo col) L := 12.5·ft  
 Beam Depth (total) h := 29.25·ft  
 Beam Width b := 8·in  
 Cover Depth c := 1.125·in  
 Slab Thickness t := 6·in  
 Tension Rebar Diameter db := 0.5·in  
 Number of Negative Bars np := 4  
 Roof Dead Load DLr := 20·psf  
 Floor Live Load LL := 100·psf  
 Roof Live Load LLr := 20·psf  
 Roof Tributary Width r1 := 10·ft  
 Roof Tributary Length r2 := 8.42·ft  
 Slab Tributary Width s1 := 10·ft  
 Slab Tributary Length s2 := 8.42·ft  
 Roof Girder Depth hg := 10·in  
 Roof Girder Width wg := 10·in  
 Number of Floors Above nf := 2

Concrete Comp. Strength fc := 2500·psi  
 Steel Yield Strength fy := 40000·psi  
 Steel Elastic Modulus Es := 29000000·psi  
 Reinf. Concrete Wt. Density yc := 150·lb·ft<sup>-3</sup>  
 Shear Reinforcement dv := 0.25·in  
 Conc. Elastic Modulus Ec := 57000·√fc·lb·in<sup>-2</sup>  
 Ec = 3 × 10<sup>6</sup> psi



**MATERIAL STRENGTHS**

Steel Increase Factor IFs := 1.1  
 Concrete Increase Factor IFc := 1.1  
 Steel Yield Strength fdy := IFs·fy  
 Concrete Comp. Strength fdc := IFc·fc

(DoD Interim ATFP Construction Standards -  
 Guidance on Structural Requirements, 3/5/01)

fdy = 44000 lb·in<sup>-2</sup>  
 fdc = 2750 lb·in<sup>-2</sup>

Distributed load along span of beam

Weight of Roof Dead Load

$$W_{\text{roof}} = 200 \frac{\text{lb}}{\text{ft}}$$

Weight of Roof girder

$$W_{\text{gird}} = 104 \frac{\text{lb}}{\text{ft}}$$

Weight of Slab at 3rd and 2nd floors:

$$W_{\text{slab}} = 1500 \frac{\text{lb}}{\text{ft}}$$

Self Weight of Deep Beam

(assume 1/3 of wall area is windows)

$$W_{\text{self}} = 1960 \frac{\text{lb}}{\text{ft}}$$

Weight Dead Load

$$W_{\text{DL}} = 3764 \frac{\text{lb}}{\text{ft}}$$

Weight of Live Load at 2 floors

$$W_{\text{floor}} = 1000 \frac{\text{lb}}{\text{ft}}$$

Weight of Roof Live Load

$$W_{\text{rooflive}} = 100 \frac{\text{lb}}{\text{ft}}$$

Weight of Live Load

$$W_{\text{LL}} = 1100 \frac{\text{lb}}{\text{ft}}$$

Sum of Distributed Load

$$W_{\text{sum}} = 4864 \frac{\text{lb}}{\text{ft}}$$

Impact Factor

$$IF = 2$$

Total Distributed Load

$$W_{\text{tot}} = 9728 \frac{\text{lb}}{\text{ft}}$$

## AVERAGE MOMENT OF INERTIA

Area of Tension Steel Bar

$$A_b = 0.196 \text{ in}^2$$

Area of Tension Steel

$$A_s = 0.785 \text{ in}^2$$

Effective Depths

$$y_t = 1.62 \text{ in}$$

$$d = 349 \text{ in}$$

Beam Moment Check

Tension Steel Force

$$T = 34558 \text{ lb}$$

Concrete Force (compression)

$$C_c = 34558 \text{ lb}$$

Estimate compression block depth

$$a = 1.85 \text{ in}$$

Ultimate Moment Capacity

$$M_u = 1 \times 10^6 \text{ lb ft}$$

Moment due to Distributed Load

$$M_w = 759987 \text{ lb ft}$$

Total Moment Demand

$$M_{tot} = 759987 \text{ lb ft}$$

$$M_{tot} < M_u \quad \text{OK}$$

Beam Shear Check

Depth of beam for shear

$$d_v = 16.11 \text{ ft}$$

(concrete not removed below windows on short side)

Beam Shear Capacity

$$V_c = 162251 \text{ lb}$$

Shear due to Distributed load

$$V_d = 121598 \text{ lb}$$

Total Shear Demand

$$V_{tot} = 121598 \text{ lb}$$

$$V_{tot} < V_c \quad \text{OK}$$

Ductility and Rotation

Gross Mom. of Inertia

$$I_g = 3 \times 10^7 \text{ in}^4$$

Elastic Stiffness

$$K_e = 9 \times 10^8 \frac{\text{lb}}{\text{ft}}$$

Ultimate Resistance

$$R_u = 80277 \text{ lb}$$

Steel Percentage

$$\rho = 0$$

Modular Ratio

$$n = 10$$

Neutral Axis of  
Transformed Section

$$k_d = 25 \text{ in}$$

Cracked Mom. of Inertia

$$I_c = 886464 \text{ in}^4$$

Avg. Mom. of Inertia

$$I_a = 1 \times 10^7 \text{ in}^4$$

Total Force

$$P = 60799 \text{ lb}$$



Equivalent Ductility	$\mu = 2.06$
Elastic Limit Displacement	$X_e = 0.0011 \text{ in}$
Peak Displacement	$X_m = 0.00227 \text{ in}$
Support Rotation	$\theta = 0.00173 \text{ deg}$ <u>&lt; 6 deg. OK</u>

## Progressive Collapse

New Exterior Beam 3rd Floor - doweled into existing beam  
(New beam supports 3rd floor, and roof loads)  
Install same new beam next to 2nd floor existing beam

$$\text{psi} := \text{lb} \cdot \text{in}^{-2}$$

$$\text{psf} := \text{lb} \cdot \text{ft}^{-2}$$

$$\text{msec} := 10^{-3} \cdot \text{sec}$$

Beam Length (wo col)  $L := 36 \cdot \text{ft}$

Beam Depth (total)  $h := 23 \cdot \text{in}$

Beam Width  $b := 15 \cdot \text{in}$

Cover Depth  $c := 2 \cdot \text{in}$

Slab Thickness  $t := 4 \cdot \text{in}$

Tension Rebar Diameter  $d_b := 1 \cdot \text{in}$

Number of Positive Tension Bars  $n_p := 6$

Number of Negative Tension Bars  $n_n := 6$

Number of floors above beam  $n_f := 1$

Column Depth  $h_c := 10 \cdot \text{in}$

Column Width  $b_c := 48 \cdot \text{in}$

Column Length (removed at 1st floor)  $L_c := 12.5 \cdot \text{ft}$

Existing Edge Beam Width  $w_e := 6 \cdot \text{in}$

Existing Edge Beam Height  $h_e := 27 \cdot \text{in}$

Slab Tributary Length  $s_1 := 20 \cdot \text{ft}$

Slab Tributary Width  $s_2 := 5.83 \cdot \text{ft}$

Roof Dead Load  $DL_r := 20 \cdot \text{psf}$

Floor Live load  $LL_f := 100 \cdot \text{psf}$

Roof Live Load  $LL_r := 20 \cdot \text{psf}$

Roof Girder Depth  $h_g := 10 \cdot \text{in}$

Roof Girder Width  $w_g := 10 \cdot \text{in}$

Parapet Height  $h_p := 4.7 \cdot \text{ft}$

Parapet Width  $w_p := 6 \cdot \text{in}$

Concrete Comp. Strength  $f_c := 3000 \cdot \text{psi}$

Steel Yield Strength  $f_y := 60000 \cdot \text{psi}$

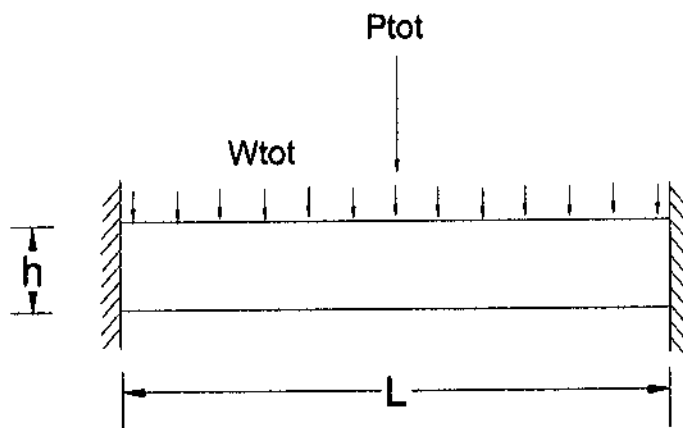
Steel Elastic Modulus  $E_s := 29000000 \cdot \text{psi}$

Reinf. Concrete Wt. Density  $\gamma_c := 150 \cdot \text{lb} \cdot \text{ft}^{-3}$

Conc. Elastic Modulus  $E_c := 57000 \cdot \sqrt{f_c \cdot \text{lb} \cdot \text{in}^{-2}}$

$$E_c = 3 \times 10^6 \text{ psi}$$

Shear Reinforcement Dia.  $d_v := 0.375 \cdot \text{in}$



## MATERIAL STRENGTHS

Steel Increase Factor  $IF_s := 1.1$

Concrete Increase Factor  $IF_c := 1.1$

Steel Yield Strength  $f_{dy} := IF_s \cdot f_y$

Concrete Comp. Strength  $f_{dc} := IF_c \cdot f_c$

(DoD Interim ATFP Construction Standards -  
Guidance on Structural Requirements, 3/5/01)

$$f_{dy} = 66000 \text{ lb} \cdot \text{in}^{-2}$$

$$f_{dc} = 3300 \text{ lb} \cdot \text{in}^{-2}$$

Point load at midspan of beam

Weight of column at 3rd floor:	$W_{col} = 6250 \text{ lb}$
Weight of Roof wall	$W_{wall} = 7050 \text{ lb}$
Weight of Roof	$W_{roof} = 2332 \text{ lb}$
Roof Girders	$W_{rgird} = 2691 \text{ lb}$
Weight Dead Load	$W_{dl} = 820 \frac{\text{lb}}{\text{ft}}$
Weight Roof Live Load	$W_{llr} = 1166 \text{ lb}$
Sum of Point Loads	$P_{sum} = 19489 \text{ lb}$
Impact Factor	
Total Point Load	$P_{tot} = 38977 \text{ lb}$

Distributed load along span of beam

Weight of Slab at 3rd floor:	$W_{slab} = 291 \frac{\text{lb}}{\text{ft}}$
Weight of 3rd floor edge beam	$W_{edge2} = 169 \frac{\text{lb}}{\text{ft}}$
Self Weight of Beam	$W_{self} = 359 \frac{\text{lb}}{\text{ft}}$
Weight Dead Load	$W_{dl} = 820 \frac{\text{lb}}{\text{ft}}$
Weight Live Load on 3rd floor	$W_{llr2} = 292 \frac{\text{lb}}{\text{ft}}$
Sum of Distributed Load	$W_{sum} = 1111 \frac{\text{lb}}{\text{ft}}$
Impact Factor	
Total Distributed Load	$W_{tot} = 2222 \frac{\text{lb}}{\text{ft}}$

## AVERAGE MOMENT OF INERTIA

Area of Tension Steel Bar

$$A_b = 0.785 \text{ in}^2$$

Effective Depths

$$y_t = 2.88 \text{ in}$$

$$d = 20.1 \text{ in}$$

$$d_e = 17.3 \text{ in}$$

Beam Moment Capacity

## AT MIDSPAN:

Area of Positive Tension Steel	$A_{sbot} = 4.712 \text{ in}^2$	
Ultimate Moment Capacity at Midspan	$M_{um} = 447088 \text{ lb ft}$	
Midspan Moment due to Point Load	$M_p = 175398 \text{ lb ft}$	
Midspan Moment due to Distributed Load	$M_w = 240003 \text{ lb ft}$	
Total Midspan Moment demand	$M_{tot} = 415401 \text{ lb ft}$	
	$M_{tot} < M_{um}$	OK

## AT SUPPORTS:

Tension Steel Area		
Ultimate Moment Capacity at Ends	$M_{us} = 447088 \text{ lb ft}$	
End Moment due to Point Load	$M_p = 175398 \text{ lb ft}$	
End Moment due to Distributed Load	$M_w = 240003 \text{ lb ft}$	
Total End Moment demand	$M_{tot} = 415401 \text{ lb ft}$	
	$M_{tot} < M_{us}$	OK

Beam Shear Check

Concrete Shear Capacity	$V_c = 34683 \text{ lb}$	
Shear Reinf. Area (3/8" dia)	$A_v := 0.11 \text{ in}^2$	
Shear Reinf. Spacing	$s_v := 12 \text{ in}$	
Number of Legs	$n_v := 2$	
Steel Shear Capacity	$V_s = 24351 \text{ lb}$	
Total Shear Capacity	$V_n = 5.9 \times 10^4 \text{ lb}$	
Shear due to Point load	$V_p = 10234 \text{ lb}$	
Shear due to Distributed load	$V_d = 40000 \text{ lb}$	
Total Shear Demand	$V_{tot} = 50234 \text{ lb}$	$V_{tot} < V_n$ OK

Ductility and Rotation

Gross Mom. of Inertia	$I_g = 15209 \text{ in}^4$
Elastic Stiffness	$K_e = 1 \times 10^6 \frac{\text{lb}}{\text{ft}}$
Ultimate Resistance	$R_u = 99353 \text{ lb}$
Steel Percentage	$\rho = 0.016$
Modular Ratio	$n = 9$
Neutral Axis of Transformed Section	$k_d = 7 \text{ in}$
Cracked Mom. of Inertia	$I_c = 9909 \text{ in}^4$
Avg. Mom. of Inertia	$I_a = 12559 \text{ in}^4$
Total Force	$P = 59489 \text{ lb}$
Equivalent Ductility	$\mu = 1.25$
Elastic Limit Displacement	$X_e = 0.88 \text{ in}$
Peak Displacement	$X_m = 1.09 \text{ in}$
Support rotation	$\phi = 0.29 \text{ deg}$ $< 6 \text{ deg OK}$

(per DoD Interim ATFP  
Construction Standards,  
Guidance on structural  
requirements, 3/5/01)





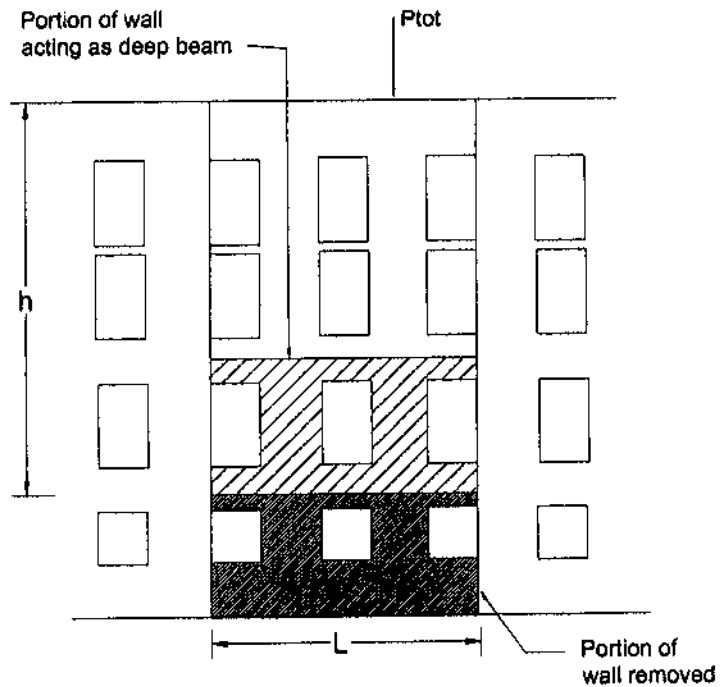
Schofield Barracks  
Building 355 - Progressive Collapse  
6" Deep Beam at 2nd floor - High roof area  
(25' length of exterior wall removed at 1st floor)

VC  $\text{psi} := \text{lb} \cdot \text{in}^{-2}$   
 $\text{psf} := \text{lb} \cdot \text{ft}^{-2}$

Width of Wall (wo col)  $L := 25 \cdot \text{ft}$   
Wall Height (total)  $h := 12.1 \cdot \text{ft}$   
Shotcrete Wall Thickness  $b := 6.0 \cdot \text{in}$   
Cover Depth  $c := 2.0 \cdot \text{in}$   
Floor Slab Thickness  $t := 6 \cdot \text{in}$   
Tension Rebar Diameter  $db := 0.625 \cdot \text{in}$   
Tension Rebar Spacing  $ds := 8 \cdot \text{in}$

Concrete Comp. Strength  $fc := 3000 \cdot \text{psi}$   
Steel Yield Strength  $fy := 60000 \cdot \text{psi}$   
Steel Elastic Modulus  $Es := 29000000 \cdot \text{psi}$   
Reinf. Concrete Wt. Density  $\gamma_c := 150 \cdot \text{lb} \cdot \text{ft}^{-3}$   
Shear Reinforcement  $ds := 0.75 \cdot \text{in}$   
Conc. Elastic Modulus  $Ec := 57000 \cdot \sqrt{fc} \cdot \text{lb} \cdot \text{in}^{-2}$   
 $Ec = 3 \times 10^6 \text{ psi}$

Number of Tension/compression Bars  $np := 3$   
Roof Dead Load  $DLr := 20 \cdot \text{psf}$   
Floor Live Load  $LL := 100 \cdot \text{psf}$   
Roof Live Load  $LLr := 20 \cdot \text{psf}$   
Roof Tributary Width  $r1 := 20 \cdot \text{ft}$   
Roof Tributary Length  $r2 := 30.42 \cdot \text{ft}$   
Slab Tributary Width  $s1 := 20 \cdot \text{ft}$   
Slab Tributary Length  $s2 := 8.42 \cdot \text{ft}$   
Number of Floors Above  $nf := 2$   
3rd floor ext. wall thickness  $t3 := 6 \cdot \text{in}$   
2nd floor ext. wall thickness  $t2 := 8 \cdot \text{in}$



MATERIAL STRENGTHS

Steel Increase Factor  $IFs := 1.1$   
Concrete Increase Factor  $IFc := 1.1$   
Steel Yield Strength  $fdy := IFs \cdot fy$   
Concrete Comp. Strength  $fdc := IFc \cdot fc$

(Dr Standards - Guidance on Structural Requirements, 3/5/01)

$fdy = 66000 \text{ lb} \cdot \text{in}^{-2}$   
 $fdc = 3300 \text{ lb} \cdot \text{in}^{-2}$

Point load on beam

Weight of Roof Load

$Wdl = 3290 \frac{\text{lb}}{\text{ft}}$

Beam Moment Check

Ultimate Moment Capacity	$M_u = 679022 \text{ lb ft}$
Midspan Moment due to Point Load	$M_{pm} = 80491 \text{ lb ft}$
Midspan Moment due to Distributed Load	$M_{wm} = 215195 \text{ lb ft}$
Total Moment Demand	$M_{tot} = 564543 \text{ lb ft}$ $\text{if}(M_u > M_{tot}, "OK", "NG") = "OK"$
End Moment due to Point Load	$M_{pe} = 134152 \text{ lb ft}$
End Moment due to Distributed Load	$M_{we} = 430391 \text{ lb ft}$
Total Moment Demand	$M_{tot} = 564543 \text{ lb ft}$ $\text{if}(M_u > M_{tot}, "OK", "NG") = "OK"$

Beam Shear Check

Depth of beam for shear	$d_v = 5.6 \text{ ft}$
Concrete Shear Capacity	$V_c = 46324 \text{ lb}$
Shear Reinf. Area (3/4" dia)	$A_v := 0.44 \cdot \text{in}^2$
Shear Reinf. Spacing	$s_v := 6 \cdot \text{in}$
Number of Legs	$n_v := 1$
Steel Shear Capacity	$V_s = 243936 \text{ lb}$
Total Shear Capacity	$V_n = 2.9 \times 10^5 \text{ lb}$
Shear due to Point load	$V_p = 28619 \text{ lb}$
Shear due to Distributed load	$V_d = 103294 \text{ lb}$
Total Shear Demand	$V_{tot} = 131913 \text{ lb}$ $\text{if}(V_n > V_{tot}, "OK", "NG") = "OK"$

Ductility and Rotation

Gross Mom. of Inertia	$I_g = 2 \times 10^6 \text{ in}^4$	
Elastic Stiffness	$K_e = 4.08 \times 10^8 \frac{\text{lb}}{\text{ft}}$	
Moment Capacity at Midspan	$M_{um} = 679022 \text{ lb ft}$	
Moment Capacity at Supports	$M_{us} = 679022 \text{ lb ft}$	
Ultimate Resistance	$R_u = 217287 \text{ lb}$	
Neutral Axis of Transformed Section	$k_d = 18 \text{ in}$	
Cracked Mom. of Inertia	$I_c = 145108 \text{ in}^4$	
Avg. Mom. of Inertia	$I_a = 837868 \text{ in}^4$	
Totat Force	$P = 121546 \text{ lb}$	
Equivalent Ductiltiy	$\mu = 1.13$	
Elastic Limit Displacement	$X_e = 0.0064 \text{ in}$	
Peak Displacement	$X_m = 0.0073 \text{ in}$	(n C G re
Support rotation	$\phi = 0.0028 \text{ deg}$	<6 deg OK
	if( $\phi < 6 \cdot \text{deg}$ , "OK" , "NG") = "OK"	

ATTACHMENT 30

CONCEPT DESIGN  
ANALYSIS OF EXISTING STRUCTURAL SYSTEM

WHOLE BARRACKS RENEWAL BRIGADE COMPLEX, PHASE 3A  
QUAD C  
FY03 MCA PN52068 & BUP 52069  
SCHOFIELD BARRACKS, OAHU, HAWAII

CONCEPT DESIGN  
ANALYSIS OF EXISTING STRUCTURAL SYSTEM  
(DEAD AND LIVE LOADS)

MITSUNAGA AND ASSOCIATES, INC  
747 AMANA STREET, SUITE 216  
HONOLULU, HAWAII 96814

## **Design Criteria**

### **1. Dead Loads**

Dead loads will be according to the actual weight of materials. Weights of various building materials will be taken from applicable tables of ASCE 7-98.

### **2. Live Loads**

Live loads will be according to requirements of ASCE 7-98. The following live loads are anticipated for these facilities:

Residential Areas .....	1.9 kPa (40 psf)
Office Areas .....	2.4 kPa (50 psf)
Assembly Areas and Exit Facilities.....	4.8 kPa (100 psf)
Storage Areas, Mechanical, and Electrical Rooms .....	12.0 kPa (250 psf)

### **3. Wind Loads**

Wind loads per ASCE 7-98. Basic wind speed (3 second gust) is 47 meters per second (105 mph). Use exposure category D.

### **4. Seismic Design Criteria**

See Seismic Evaluation and Rehabilitation Report for Quad C (reference 14).

### **5. Antiterrorism / Force Protection Design Criteria and Progressive Collapse Mitigation**

See Progressive Collapse Vulnerability Assessment (reference 15).

## **Existing Structural System**

An analysis was performed on the vertical load-carrying capacity of typical framing elements for the buildings in Quad C, based on available existing drawings (references 10-12) and on material properties from similar adjacent buildings (reference 13). The existing wood roof framing was excluded from the analysis, since new structural steel framing and metal decking will be installed to support the lateral load (seismic) and air-blast requirements indicated.

Based on the information available, no rehabilitation is required for the vertical load-carrying elements, specifically, the concrete walls, columns, slabs, and beams. Calculations are provided at the end of this report.

## **Materials**

1. **Concrete (Existing Structure)**  
Class 20 MPa (2,500 psi) for all existing concrete work and Grade 300 (40) reinforcing bars were assumed based on guidance found in FEMA 273 and on studies of similar adjacent buildings provided by COE (reference 13).
2. **Concrete (Renewal Work)**  
Class 25 MPa (3,500 psi) concrete shall be used for all new slabs built on grade; Class 30 MPa (4,000 psi) concrete for all non-prestressed structural slabs, beams, and columns; Class 25 MPa (3,000 psi) concrete for footings, equipment pads, and other uses not included under the Classes noted above. Crack control shall be provided in accordance with reference 1. Concrete reinforcing bars shall be ASTM A 615M, Grade 420 (60).
3. **Concrete Masonry Units (Renewal Work)**  
Hollow Concrete Masonry Units shall be load-bearing units, ASTM C 90, Grade N-II. Mortar shall conform to ASTM C 270, Type S, with a minimum 28-day strength of 12 MPa (1,800 psi). Grout shall conform to ASTM C 476, with a minimum 28-day strength of 15 MPa (2,000 psi).
4. **Structural Steel (Renewal Work)**  
Structural steel shall be carbon steel, ASTM A 36M grade, shop primed. Provide high-strength bolted connections using ASTM A 325M, Type I, heavy hex bolts, plain, uncoated. Anchor bolts may be unheaded rods, ASTM A 36M; anchor bolts shall be hot-dip galvanized.
5. **Metal Roof Decking (Renewal Work)**  
Roof deck and accessories shall be formed from steel sheets conforming to ASTM A 653M. The deck shall be galvanized in accordance with ASTM A 653M, Class Z275 (G-90).

## DESIGN GRAVITY LOADS

PAGE 1

PROJ: SCHOFIELD BARRACKS, QUAD C  
 TITLE: DESIGN LOADS

DATE: 03/04 2003  
 TIME: 14:34 P.M.

## TYPICAL FLOOR:

RISE/12 =	0	FACTOR =	1.00
	WEIGHT (psf)	SLOPE FACTOR	WEIGHT (psf)
6" THK CONC	75	1.00	75.00
PARTITION	20	1.00	20.00
CEILING	3	1.00	3.00
MECH/MISC	3	1.00	3.00
TOTAL DEAD LOAD			101.00
TOTAL LIVE LOAD	50	1.00	50.00
TOTAL LOAD			151.00

## TYPICAL BALCONY:

RISE/12 =	0	FACTOR =	1.00
	WEIGHT (psf)	SLOPE FACTOR	WEIGHT (psf)
4" THK CONC	50	1.00	50.00
PARTITION	0	1.00	0.00
CEILING	0	1.00	0.00
MECH/MISC	3	1.00	3.00
TOTAL DEAD LOAD			53.00
TOTAL LIVE LOAD	100	1.00	100.00
TOTAL LOAD			153.00



## DESIGN GRAVITY LOADS

PAGE 2

PROJ: SCHOFIELD BARRACKS, QUAD C  
TITLE: DESIGN LOADS

DATE: 03/04 2003  
TIME: 14:34 P.M.

## TYPICAL ROOF:

RISE/12 =	0.5	FACTOR =	1.00
	WEIGHT (psf)	SLOPE FACTOR	WEIGHT (psf)
TAR & GRAVEL	6	1.00	6.01
2x DECKING	4.5	1.00	4.50
2x8 @ 16 RAFTERS	2	1.00	2.00
2x8 @ 16 JOISTS	2	1.00	2.00
TRUSSES @ 20 FT	1.5	1.00	1.50
CEILING	3	1.00	3.00
MECH/MISC	5	1.00	5.00
TOTAL DEAD LOAD			24.02
TOTAL LIVE LOAD	20	1.00	20.00
TOTAL LOAD			44.02

# EXIST. SLAB REINFORCING

## 3rd Floor

2" x 12" - #3 x #8 Clinton Mesh

$$\begin{aligned}\text{Longitudinal Reinf.} &= \text{No. 3 Gage @ 2" oc} \\ &= (.244)^2 \pi / 4 \times 12/2 \\ &= 0.28 \text{ in}^2/\text{ft}\end{aligned}$$

$$\begin{aligned}\text{Transverse Reinf.} &= \text{No. 8 Gage @ 12" oc} \\ &= (.162)^2 \pi / 4 \times 12/12 \\ &= 0.02 \text{ in}^2/\text{ft}\end{aligned}$$

## 2nd Floor

2" x 12" - #3 x #12 Clinton Mesh

$$\text{Longitudinal Reinf.} = 0.28 \text{ in}^2/\text{ft}$$

$$\begin{aligned}\text{Transverse Reinf.} &= \text{No. 12 Gage @ 12" oc} \\ &= (.106)^2 \pi / 4 \times 12/12 \\ &= 0.01 \text{ in}^2/\text{ft}\end{aligned}$$

## 3rd Floor Walls

$$\begin{aligned}6" \times 6" - \#6 \text{ mesh} &= (.192)^2 \pi / 4 \times 12/6 \\ &= 0.06 \text{ in}^2/\text{ft}\end{aligned}$$

DESCRIPTION	Mitsunaga & Associates, Inc.	BY: <u>ILL</u>	CHECKED
	PROJECT: <u>CLAD C</u>	JOB NO.	SHEET
		DATE <u>12/27/02</u>	OF <u>9</u>

# EXISTING SLAB ANALYSIS

## Typical Slab

$$w_u = \begin{pmatrix} 1.2 \\ 0.5 \end{pmatrix} \begin{pmatrix} .101 \\ .050 \end{pmatrix} = 0.146 \text{ k/ft}$$

$$M_u = .146 (10.5)^2 / 8 = 4.98 \text{ k-ft}$$

$$F = 5.25^2 / 1000 = .0276$$

$$K_u = 4.98 / .0276 = 181$$

$$\rho = .0035$$

$$A_s = .0035 \times 12 \times 5.25 = 0.22 \text{ in}^2/\text{ft}$$

$$A_{prov} = 0.28 \text{ in}^2/\text{ft} \text{ OK}$$

∴ Existing slab reinforcing OK

## Corridor Slab

$$w_u = \begin{pmatrix} 1.2 \\ 0.5 \end{pmatrix} \begin{pmatrix} .053 \\ .020 \end{pmatrix} = .114 \text{ k/ft}$$

$$M_u = .114 (10.5)^2 / 8 = 1.57 \text{ k-ft}$$

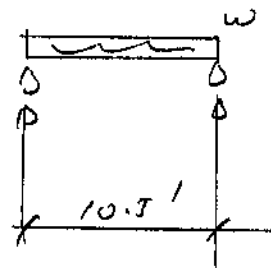
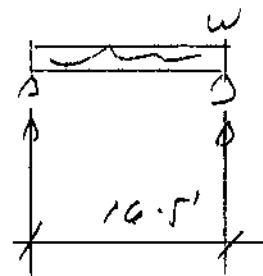
$$F = 3^2 / 1000 = .009$$

$$K_u = 174$$

$$\rho = .0033$$

$$A_s = .0033 \times 12 \times 3 = 0.12 \text{ in}^2/\text{ft}$$

$$A_{prov} = 0.28 \text{ in}^2/\text{ft} \text{ OK}$$



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BY: lca

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PROJECT:

W L A D C

JOB NO.

SHEET

DATE

12/2/20

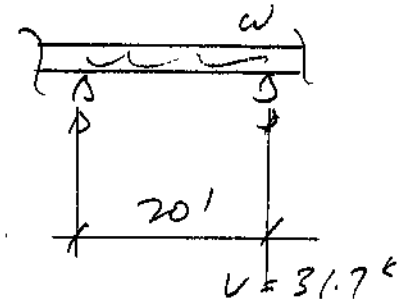
OF

10

# EXIST. FLOOR BEAM CHECK - TYPICAL 3-SPAN BEAM

$$\text{Top Reinf} = 2-1''\phi + 1-3/4''\phi \text{ vods} \\ = 2.02 \text{ in}^2$$

$$\text{Bot. Reinf} = 4-1''\phi + 2.02 \text{ in}^2 \\ = 5.18 \text{ in}^2$$



$$w_u = \left( \frac{1.2}{0.5} \right) \left( \frac{.101}{.050} \right) \times 16.33 \\ \cdot 1.2 \times .150 \times 14 (20-6) / 144 \\ = \left( \frac{2.22}{0.41} \right)^{1/1}$$

$$m_u^- = 0.100(2.22)(20)^2 + 0.1167(0.41)(20)^2 = 108 \text{ k}$$

$$F = 14 \times 18^2 / 12000 = 0.378$$

$$K_n = 286$$

$$\rho = .0085 \text{ (Gr. 40)} \quad A_s = .0085 \times 14 \times 18 \\ = 2.15 \text{ in}^2$$

OK, can include slab  
reinf. in "flanges"

$$m_u^+ = 0.0735(2.22)(20)^2 + 0.1013(0.41)(20)^2 = 82 \text{ k}$$

$$F = 0.378$$

$$K_n = 217$$

$$\rho = .0064 \text{ (Gr. 40)} \quad A_s = .0064 \times 14 \times 18 \\ = 1.60 \text{ in}^2$$

$$< 5.18 \text{ in}^2 \quad \text{OK}$$

$$\phi V_c = 2(.85)\sqrt{2500}(14 \times 18) = 21.4 \text{ k}$$

$$\phi V_s = \frac{2(.05)(.85)(40)(18)}{6} = 10.0 \text{ k}$$

1/4" d stirrups  
@ 6" o.c

$$31.4 \text{ k} \approx 31.7 \text{ k} \quad \text{OK}$$

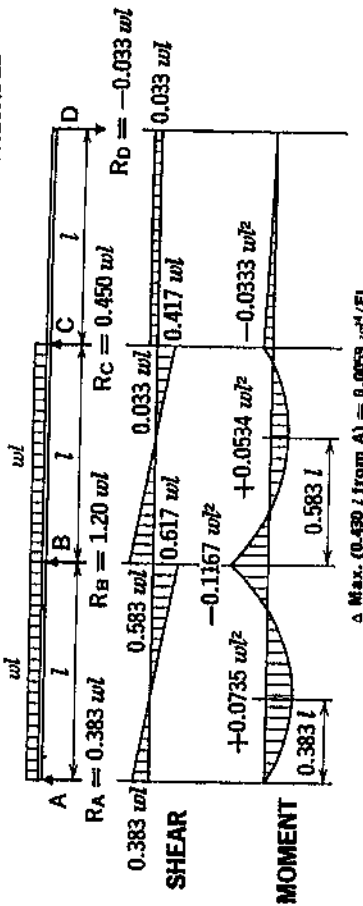
DESCRIPTION	Mitsunaga & Associates, Inc.	BY: <u>LL</u>	CHECKED
	PROJECT: <u>QVAD C</u>	JOB NO.	SHEET
		DATE <u>11/23/02</u>	OF <u>11</u>

# BEAM DIAGRAM AND DEFLECTIONS

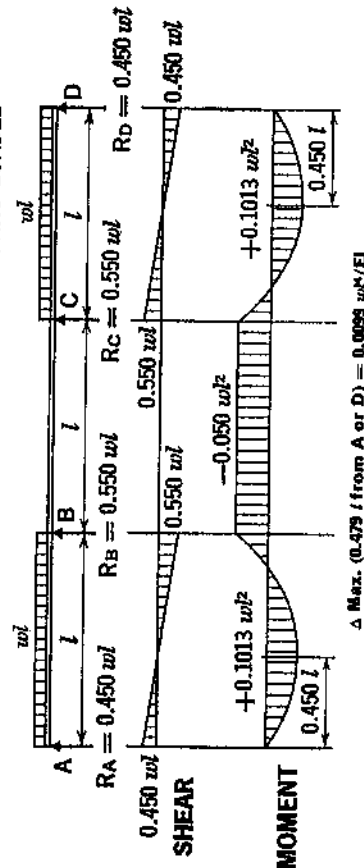
For various static loading conditions

For meaning of symbols, see page 2 - 293

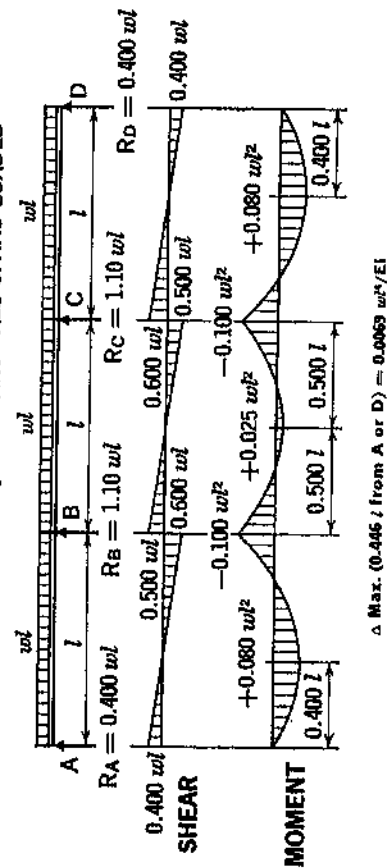
## 34. CONTINUOUS BEAM—THREE EQUAL SPANS—ONE END SPAN UNLOADED



## 35. CONTINUOUS BEAM—THREE EQUAL SPANS—END SPANS LOADED



## 36. CONTINUOUS BEAM—THREE EQUAL SPANS—ALL SPANS LOADED

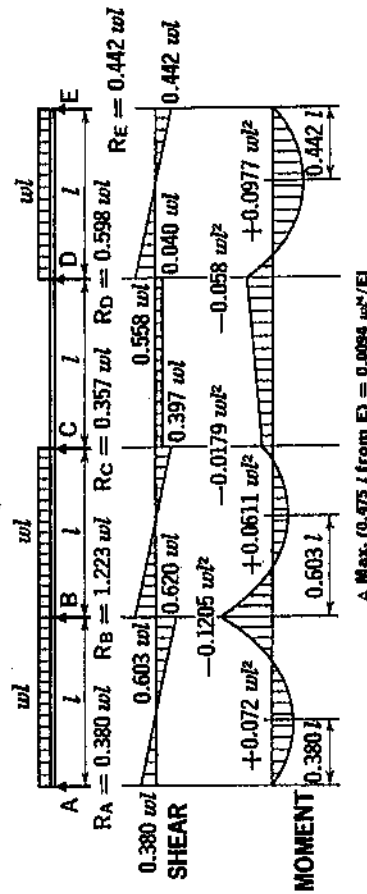


# BEAM DIAGRAMS AND DEFLECTIONS

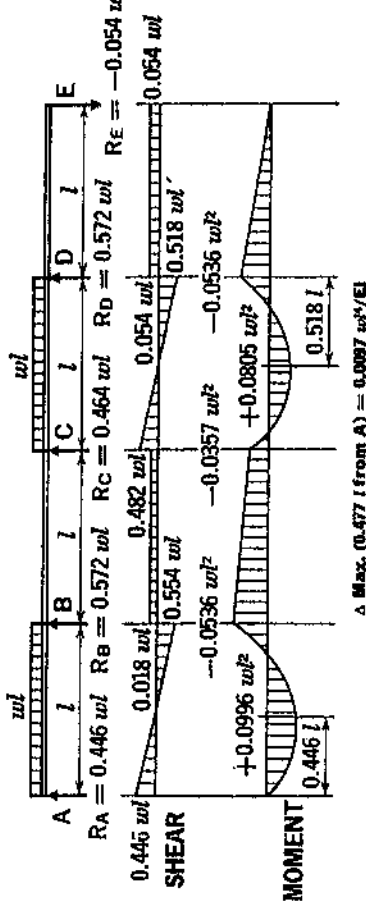
For various static loading conditions

For meaning of symbols, see page 2 - 293

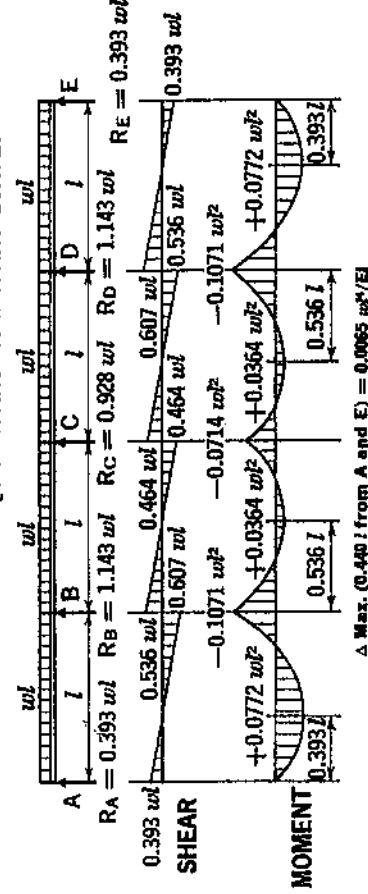
## 37. CONTINUOUS BEAM—FOUR EQUAL SPANS—THIRD SPAN UNLOADED



## 38. CONTINUOUS BEAM—FOUR EQUAL SPANS—LOAD FIRST AND THIRD SPANS



## 39. CONTINUOUS BEAM—FOUR EQUAL SPANS—ALL SPANS LOADED



# EXIST. COLUMN ANALYSIS

Do not consider reinforcing in vertical load-carrying capacity - not enough ties to contain load

## 3rd Floor Column (10" x 10")

$$P_u = \left( \frac{1.2}{0.5} \right) \left[ \begin{array}{l} \text{Roof} \\ .024 \times 20 \times 16.33 + .150 \times 10^2 / 144 (36.33 + 12) \\ \text{Conc. Bms Above} \\ \text{Conc. Col} \\ .020 \times 20 \times 16.33 \end{array} \right]$$

$$= \left( \frac{1.2}{0.5} \right) \left[ \begin{array}{l} 12.9 \\ 6.53 \end{array} \right]$$

$$= 18.7^k$$

$$\phi P_c = 0.85(0.70) \left[ 0.85(2.5)(10)^2 \right] = 126^k \quad \text{OK}$$

## 2nd Floor Column (12" x 12")

$$P_u = \left( \frac{1.2}{0.5} \right) \left[ \begin{array}{l} .101 \times 20 \times 16.33 + .150 / 144 (12 \times 20^2) + 12 \times 12 \times 12 \\ .050 \times 20 \times 16.33 \end{array} \right]$$

$$+ P_{u \text{ 3rd}}$$

$$= \left( \frac{1.2}{0.5} \right) \left[ \begin{array}{l} 39.8 + 12.9 \\ 16.3 + 6.53 \end{array} \right]$$

$$= 74.7^k$$

$$\phi P_c = 0.85(0.70) \left[ 0.85(2.5)(12)^2 \right] = 182^k \quad \text{OK}$$

DESCRIPTION

**Mitsunaga & Associates, Inc.**

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EXIST. COLUMN ANALYSIS (CONT.)

Ground Floor Column (14" x 14")

$$P_u = \begin{bmatrix} (2)(39.8) + 12.9 \\ (2)(16.3) + 6.53 \end{bmatrix}$$
$$= 132^k$$

$$\phi P_c = 0.85(0.70) [ 0.85(2.5)(14)^2 ] = 248^k \text{ ok}$$

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# EXISTING WALL ANALYSIS

## Ground Floor Wall (8" thick)

$$\begin{aligned}
 P_u &= (1.2) \left[ \overset{\text{Roof}}{(.024 \times 13.83)} + \overset{\text{Floor}}{(.101 \times 8.41)} + \overset{\text{Balcony}}{(.053 \times 5.41)} \right] \\
 &\quad (0.5) \left[ (.020 \times 13.83) + (.050 \times 8.41) + (.100 \times 5.41) \right] \\
 &\quad + 1.7 \left[ (.075 \times 12) + (.100 \times 12) \right] \\
 &= (7.08)^k \\
 &= 8.18^k \text{ per ft of wall}
 \end{aligned}$$

per ACI 318, Eq. 14-1,

$$\phi P_{nw} = 0.55 \phi f'_c A_g \left[ 1 - \left( \frac{K l_c}{32 h} \right)^2 \right]$$

where  $\phi = 0.70$

$$A_g = 12 \times 8 = 96 \text{ in}^2$$

$$K = 1$$

$$l_c = 12 \times 12 = 144 \text{ in}$$

$$h = 8"$$

$$f'_c = 2.5 \text{ ksi}$$

$$\begin{aligned}
 \phi P_{nw} &= 0.55(0.70)(2.5)(96) \left[ 1 - \left( \frac{(1)(144)}{32(8)} \right)^2 \right] \\
 &= 63.2^k \text{ per ft of wall}
 \end{aligned}$$

For 5'-0" trib (openings to solid wall),

$$P_u = 8.18 \times 5 = 41^k < 63.2^k \text{ OK,}$$

DESCRIPTION	Mitsunaga & Associates, Inc.	BY:	CHECKED
		JOB NO.	SHEET OF 15
PROJECT: QVAD C	DATE		



## WIND LOADS PER - ASCE 7

$$\text{Velocity pressure, } q_z = 0.00256 K_z K_{zt} K_d V^2 I$$

where  $K_z = 1.05$  for  $H_{\text{roof}} = 41.5'$ , Exp. C

$K_{zt} = 1$  (no topographic effect)

$K_d = 1$  (used 0.85 for load comb.)

$V = 105$  mph

$I = 1.15$

$$\begin{aligned} q_z &= 0.00256(1.05)(1)(1)(105)^2(1.15) \\ &= 34.1 \text{ psf} \end{aligned}$$

### Main Wind Force Resisting System for Low Rise Bldgs

$$P = q_h [G C_{pf} - (G C_{pi})]$$

where  $q_h = q_z$  for  $H_{\text{roof}} = 34.1$  psf

$G C_{pf} = 0.40$  , windward wall (in)  
           $= 0.09$  , windward roof  $\uparrow$   
           $= 0.37$  , leeward roof  $\uparrow$   
           $= 0.29$  , leeward wall (out)

$G C_{pi} = 0.18$  , enclosed building  
(based on area of openings)

$$P = 34.1 [(0.40 + 0.29) + 0.18] = 29.7 \text{ psf}$$

$V_{\text{transverse}} = 29.7 (41.5 \times 364) = 449 \text{ K} < 7500 \text{ K} +$   
 $\therefore \text{SEISMIC LOAD CONTROLS!}$   
min. seismic  
(6 bldg 355)

DESCRIPTION	<b>Mitsunaga &amp; Associates, Inc.</b>	BY:	CHECKED
	PROJECT: <u>QUAD C</u>	JOB NO.	SHEET
		DATE	OF
			16

## WALL LOCATION: PRELIMINARY ELEVATOR FOOTING SIZE FOR DEAD AND LIVE LOADS

FOOTING TYPE: F-5

FLR LEVEL ID	FLR HT (ft)	COL WIDTH (ins)	COL DEPTH (ins)	WALL THK (ins)	WALL LEN (ft)	BEAM WIDTH (ins)	BEAM DEPTH (ins)	GIRD WIDTH (ins)	GIRD DEPTH (ins)	LEN (ft)	TRIB1 WIDTH (ft)	LEN (ft)	TRIB1 LOAD (psf)	LIVE1 LOAD (psf)	TRIB2 WIDTH (ft)	LEN (ft)	TRIB2 LOAD (psf)	LIVE2 LOAD (psf)	DEAD LOAD (k)	SLIVE LOAD (k)	DEAD LOAD (k)	LIVE LOAD (k)	DEAD TOT (k)	LIVE TOT (k)
ROOF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0
3RD	12	0	0	8	24.5	0	0	0	0	0	17.83	6.5	24	20	9	6.5	75	10	0	0	7.2	2.9	36.6	2.9
2ND	12.58	0	0	8	24.5	0	0	0	0	0	4.25	6.5	101	50	5.42	6.5	53	100	0	0	4.7	4.9	72.0	7.8
GRND	16.58	0	0	8	31	0	0	0	0	0	4.25	6.5	101	50	5.42	6.5	53	100	0	0	4.7	4.9	128.1	12.7
41.2																								

41.2

Footing Size:

8.50 ft x

11.00 ft x

16.00 ins

Soil Pressure:

1839 psf

128.1

12.7 kips

# WALL FOOTING STABILITY CHECK

PROJECT: QUAD C -- BUILDING 355  
DESCRIP: ELEVATOR FOOTING

FOOTING LENGTH = 11.00 ft  
BASE HGT = 2.67 ft  
  
Mot = 0.0 ft-k  
Vot = 0.0 k  
sumMOT = 0.0 ft-k

## GRAVITY LOADS

DESCRIPTION	PCF	THK (in)	WIDTH (ft)	LEN (ft)	P (k)	d (ft)	M (k-ft)
FOOTING	150	16	8.50	11	18.70	5.50	102.85
SOIL	100	8.7	8.50	11	6.80	5.50	37.40
				SUM	25.50		140.25

DESCRIPTION	w (k/ft)		LEN	P (k)	d (ft)	M (k-ft)
END WALLS	8.24	(0.1*41.2*2)	6.5	53.56	5.50	294.58
ROOF	0.78	(.044*17.83)	6.5	5.10	1.33	6.78
BALCONY FLOORS	1.28	(0.151*4.25*2)	6.5	8.34	1.33	11.10
INTERIOR FLOORS	1.66	(0.153*5.42*2)	6.5	10.78	9.67	104.25
				SUM	77.78	416.70

DESCRIPTION		P (k)	d (ft)	M (k-ft)
SIDE WALLS	(0.1*41.2*9*2)	74.16	5.50	407.88
ELEVATOR SLAB	(0.085*6.5*9)	4.97	5.50	27.35
		0.00	0.00	0.00
		SUM	79.13	435.23
		SUMTOT	182.42	992.18

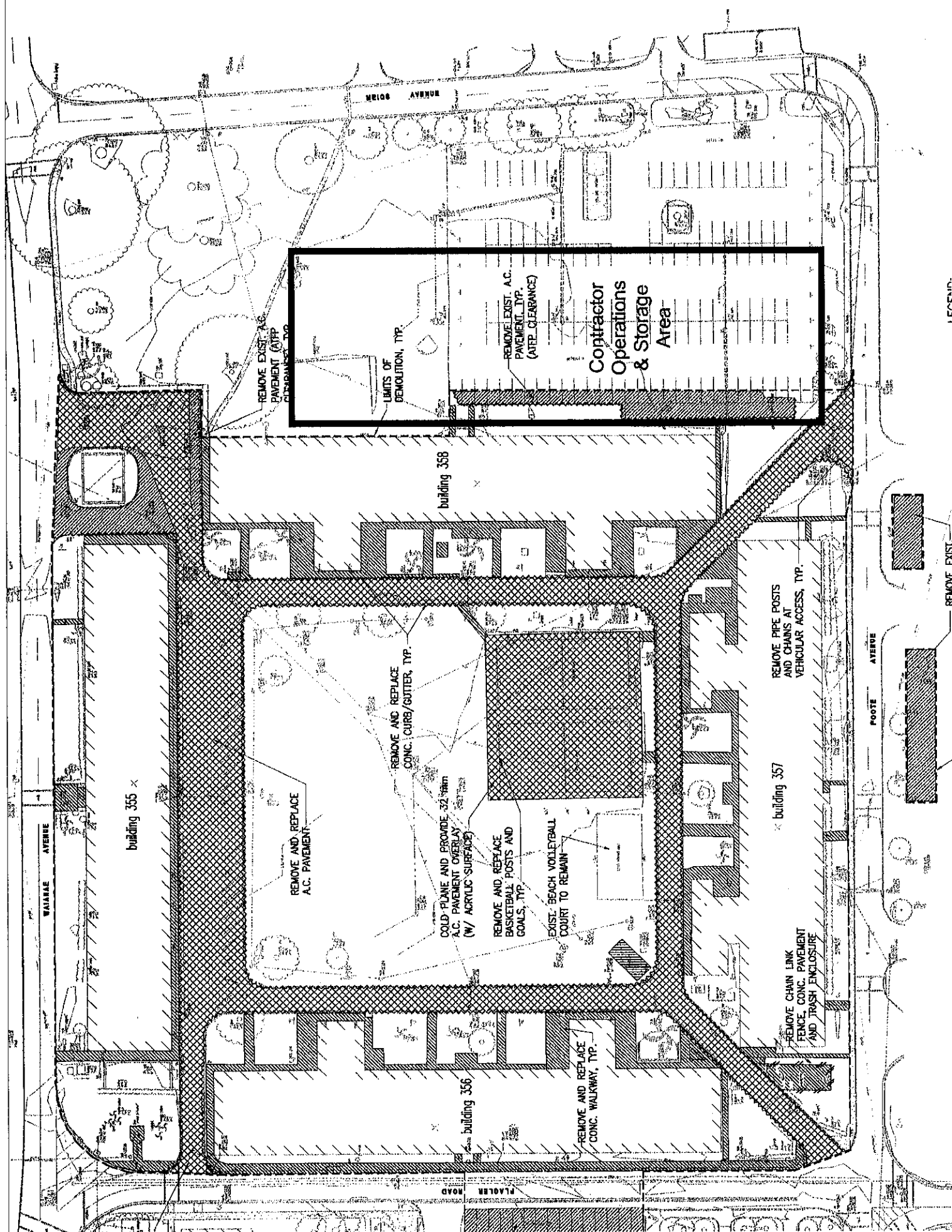
MNET = 992.18 ft-k  
a = 5.44 ft  
3a = 16.32 ft  
e = 0.06  
SMOD = 171.4 ft^3

F.S.ot = 992183

FIND F @ GIVEN d:  
Fmax = 2.02 ksf  
Fmin = 1.89 ksf  
Fallow = 2.00 ksf  
d = 5.00 ft  
F = 1.96 ksf

## ATTACHMENT 31

### CONTRACTOR OPERATIONS & STORAGE AREA



## SECTION 01012

**DESIGN AFTER AWARD****1.0 GENERAL**

1.1 The Contractor shall propose a schedule for the number and composition of the design submittal phases. As a minimum, design submittals are required at the preliminary (50%), pre-final (90%) and final (100%). The requirements of each design stage are listed hereinafter. The Contractor shall reflect the number and schedules for the design submittals phases in the progress charts. As a maximum, the 50%, 90% and 100% shall be made into one consolidated package, which includes each of the thirteen (13) major categories listed in Paragraph, "Contents of 50% Design Submittal," the Building Interior Design, and long lead item submittals.

1.2 "Fast-tracking" is not allowed. The Contractor will not be allowed to proceed with construction until the Contracting Officer approves the 100% final design submittal.

**2.0 DESIGNER OF RECORD**

The Contractor shall identify a Designer of Record ("DOR") for each area of design. All design disciplines shall be accounted for by listed, registered Designer(s) of Record. Each DOR shall be responsible for ensuring integrity of their design and design integration in all construction submittals and extensions to design developed by others, such as the constructor, subcontractors or suppliers. The DOR shall review and approve all construction submittals and extensions to design, in accordance with the procedures, described in Section 01330 SUBMITTALS. Each DOR shall be responsible for the responses to "Requests for Information" (RFI's), applicable to their area of design responsibility. Each DOR shall stamp, sign, and date all design drawings under their responsible discipline at each design submittal stage (see Contract clause - "REGISTRATION OF DESIGNERS") and all submittals under their responsible discipline, in accordance with the submittal review procedures. The DOR shall sign-off on all applicable RFI responses. "

**3.0 DEFINITION OF DESIGN SUBMITTALS**

3.1 **PRELIMINARY CONFORMANCE REVIEW SUBMITTAL (50%).** The review of this submittal is primarily to insure that the contract documents and design analysis are proceeding in a timely manner and that the design criteria is being corrected interpreted. The submittal shall consist of the following:

1. Design Analysis, developed to 50%
2. 50% complete drawings
3. Outline Specifications
4. Environmental permits, as required. When environmental permits are not required, the Contractor shall provide a statement with justification to that effect.

3.2 **PRE-FINAL REVIEW SUBMITTAL (90%).** Hard copies and CADD drawings. The review of this submittal is to insure that the design is in accordance with directions provided the Contractor during the design process as well as the 50% submittal. The Contractor shall submit the following documents for Pre-final Design Review:

3.2.1. Design Analysis. The Design Analysis submitted for pre-final Design Review shall be in its final form. The Design Analysis shall include all backup material previously submitted and revised as necessary. All design calculations shall be included. The Design Analysis shall contain all explanatory material giving the design rationale for any design decisions, which would not be obvious to an engineer reviewing the Final Drawings and Specifications.

3.2.2. Drawings. The Contract Drawings submitted for pre-final Design Review shall include the drawings previously submitted which have been revised and completed as necessary. The Contractor is expected to have completed all of his coordination checks and have the drawings in a design complete condition. The drawings shall be complete at this time including the incorporation of any design review comments generated by the previous design review. The drawings shall contain all the details necessary to assure a clear understanding of the work throughout construction. Shop drawings will not be considered as design drawings. All design shall be shown on design drawings prior to submittal of shop drawings.

3.2.3. Specifications. The Draft Specifications on all items of work submitted for pre-final Design Review shall consist of legible marked-up specification sections.

3.2.4. Preliminary Conformance Review Submittal Annotated Review Comments (50%). Submittal review comments and responses.

3.3 **FINAL DESIGN SUBMITTAL (100%).** Hard copies and CADD drawings. The review of this submittal is to insure that the design is in accordance with directions provided the Contractor during the design process as well as the 50% submittal. The Contractor shall submit the following documents for Final Design Review:

3.3.1 Final Design Submittal, 1<sup>st</sup> Backcheck (100%). Hard copies and CADD drawings.

3.3.2 Final Design Submittal. 2<sup>nd</sup> Backcheck (a second backcheck submittal will be made if all of the comments were not satisfactorily resolved in the 1<sup>st</sup> Backcheck submittal as determined by the Contracting Officer). Note that additional backchecks will be required until all of the comments have been satisfactorily resolved.

3.3.3 Design Analysis, in final 100% complete form.

3.3.4 100% complete drawings.

3.3.4 Final typed specifications.

3.3.5 Environmental permits. When environmental permits are not required, the Contractor shall provide a statement with justification to that effect.

3.3.6 Pre-final Design (90%) Submittal review comments and responses.

3.3.7 Electronic Submission: All CADD files in native MicroStation Version 8 or latest format, as well as all prepared technical specifications shall be provided on CD-ROM. Two copies are required.

### 3.4 **COMPREHENSIVE INTERIOR DESIGN**

3.4.1 Definition. The Comprehensive Interior Design (CID) shall involve the selection and sampling of all applied finishes including material, color, texture and patterns necessary to complete the building's interior architectural features. The CID shall meet all requirements addressed in SOW CH 14, Comprehensive Interior Design.

3.4.2 Samples. Present architectural finish samples in orderly arrangements according to like rooms/areas receiving like finish. Each like room receiving like finishes will be noted as a Color Scheme. Each Color Scheme shall have a written description of material used. This written description shall use the same material abbreviations and notes that appear on the Room Finish Schedule and Legend in the contract drawings. Present pre-wired workstation finishes on a color board separate from the architectural finishes. Submit the CID binders concurrently with the architectural design submittals.

3.4.3 Preliminary Submittals. The Contractor shall submit three complete sets of the initial CID package. The design philosophy shall use a warm neutral background color with appropriate accent colors. All CID proposals shall be reviewed and approved by the Government. The Interior Designer shall revise the CID binders after each review and update the CID to satisfy review comments. Each submittal will follow this method of review until the Government approves the completed CID package.

3.4.4 Government Approval. Government approval will be sought from the Honolulu Engineer District, which is the District Authority Having Jurisdiction (DAHJ). The DAHJ will be consulted for all interpretations of Comprehensive Interior Design (CID) to be used in this project through the Contracting Officer. The Contractor shall direct all questions, interpretations and clarifications to the Contracting Officer. All requests for information by the Contractor shall be submitted to the Contracting Officer in writing with the appropriate sketches, basis for waiver, specific question and any other information deemed necessary by the DAHJ. In general, a minimum of seven (7) calendar days is required by the DAHJ to respond to all inquiries. The seven days will start from the day of receipt by the Contracting Officer. In the event interpretation or approval is required from HQUSACE, an additional seven (7) calendar days will normally be required.

3.4.5 Final Submittal. After approval of the Preliminary Submittal, the Contractor shall submit three (3) complete sets of the approved and final Comprehensive Interior Design package. Once the Contractor has submitted the CID and the Government has approved the submittal, all materials, finishes, colors, textures and pattern submitted and approved for this project are then considered as part of the contract and the Contractor shall furnish all approved CID finishes. No deviations will be considered.

3.4.6 Format. Submit all CID information and samples on 8 1/2"x 11" modules. Place the project title, base, architectural firm, page number and date on the bottom of each page or module.

3.4.6.1 The module shall support and anchor all samples. Anchor large or heavy samples with mechanical fasteners, Velcro, double-sided foam tape or contact cement. Rubber cement or glue will not be acceptable.

3.4.6.2 Assemble the 8 1/2" x 11" pages and modules in a 3" D-ring binder. Holes for placement of the modules in the binder shall be 3/8" in diameter. Each binder shall be identified on the outside spine and front cover by title, project number, percentage phase and date.

3.4.6.3 Material and finish samples shall indicate true pattern, color and texture.

3.4.6.4 Where paint manufacturers color names and numbers are used indicated the finish of the paint such as gloss, semi-gloss, flat and so on.

3.4.6.5 Signage may include emblems, striping, letters, numbers and logos. The interior designer shall consider visual appearance, organization, location, structural supports (if required) and relation to other base graphics. Indicate on a separate signage sheet the location and message for all signage. Submit a sample of the signage material finish and color with the structural finishes.

3.4.6.6 No photographs or colored photocopies of materials will be accepted or approved.

3.4.7 CID Binder. The CID Binder shall include the following information at each design submittal in this order:



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**SEQUENCE OF CID SUBMITTAL**

1. Title page
2. Table of contents
3. Design objectives - A statement of design objectives explaining the interior design philosophy of the facility shall be provided in the CID. Design objectives and the proposed method of accomplishing the objectives. Shall cover, when applicable, energy efficiency, safety, health, maintenance, image, personal performance of occupants and functional flexibility.
4. Interior floor plan
5. Interior sample finish boards  
  
Scheme A  
Scheme B  
Scheme C

Example all restrooms could be noted as color scheme "A", all general open office finishes could be noted as color scheme "B" and the main lobby could be noted as color scheme "C".

6. Room finish schedule
  7. Signage
  8. Signage plan
  9. Pre-wired workstation composite floor plans
  10. Pre-wired workstation typical - elevations and component inventory.
  11. Pre-wired workstation panel identification plan with electrical outlet placement including base feed.
  12. Plan must show suitability of proposed space to suit the furniture to be provided.
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#### 4.0 QUANTITY OF DESIGN SUBMITTALS

4.1 General. The documents, which the Contractor shall submit to the Government for each submittal, are listed and generally described hereinafter.

##### DISTRIBUTION

Activity and Address	Drawing Size <Full>	Drawing Size <Half>	Color Boards**
U.S. Army Corp. of Engineers Honolulu Engineering District Bldg. 230, Room 318 Ft. Shafter, HI 96858 Attn: CEPOH-PP-A / Kenneth Cabalce	4	3	1
U.S. Army Corp. of Engineers Honolulu Engineering District Schofield Barracks, HI Attn: CEPOH-EC-S	2	2	1
U.S. Army Corp. of Engineers Honolulu Engineering District Bldg. 230, Room Ft. Shafter, HI 96858 Attn: CEPOH-EC-T	4	2	1
U.S. Army Corp. of Engineers Honolulu Engineering District Bldg. 230, Room Ft. Shafter, HI 96858 Attn: CEPOH-EC-D	2	2	1
U.S. Army Corp. of Engineers Honolulu Engineering District Bldg. 220, Room Ft. Shafter, HI 96858 Attn: CEPOH-EC-E	1	1	
3 <sup>rd</sup> Brigade Commander Schofield Barracks, HI	2	1	1
Director of Public Works U.S. Army Garrison, Hawaii Attn: Michael Kumabe WAAF, Schofield Barracks, HI 96857-5013	4	2	1

## DISTRIBUTION

Activity and Address	Drawing Size <Full>	Drawing Size <Half>	Color Boards**
Directorate of Information Management U.S. Army Garrison, Hawaii Attn: Thomas Weber Fort Shafter, HI	2	2	
Military Police Battalion, Hawaii Attn: Harold Evans Helemano Military Reservation, HI	1	1	
State Historic Preservation Office Honolulu, HI		3	
Army Community of Excellence, Services Fort Lee, VA	1	1	
U.S. Army Information System Engineering Command Fort Detrick, MD	1	1	
U.S. Army Installation Management Agency Pacific Regional Office Fort Shafter, HI		1	

\*\* Color boards shall be submitted with the 100% building submittal only.

## 5.0 MAILING OF DESIGN SUBMITTALS

5.1 General. Mail all design submittals to the Government during design and construction, using an overnight mailing service. The Government will furnish the Contractor addresses where each copy shall be mailed to after award of the contract. The submittals shall be mailed to the addresses listed in para. 4.1 Distribution.

5.2 Transmittal Letter. Each design submittal shall have a transmittal letter accompanying it indicating the date, design percentage, type of submittal, list of items submitted, transmittal number and point of contact with telephone number.

## 6.0 COORDINATION

6.1 Written Records. The Contractor shall prepare a written record of each design site visit, meeting, or conference, either telephonic or personal, and furnish within five (5) working days copies to the Contracting Officer and all parties involved. The written record shall include subject, names of

participants, outline of discussion, and recommendation or conclusions. Number each written record for the particular project under design in consecutive order.

6.2 Design Needs List. Throughout the life of his contract the Contractor shall furnish the COR a monthly "needs" list for design related items. This list shall itemize in an orderly fashion design data required by the Contractor to advance the design in a timely manner. Each list shall include a sequence number, description of action item, name of the individual or agency responsible for satisfying the action item and remarks. The list will be maintained on a continuous basis with satisfied action items checked off and new action items added as required. Once a request for information is initiated, that item shall remain on the list until the requested information has been furnished or otherwise resolved. Copies of the list will be mailed to both the Administrative Contracting Officer and the agencies tasked with supplying the information.

## 7.0 GOVERNMENT REVIEW

7.1 Design Schedule. Within 30 days after Notice to Proceed, the Contractor shall submit, for approval, a complete design schedule with all submittals and review times indicated in calendar dates. The Contractor shall update this schedule monthly. No design submittals will be reviewed or evaluated until after receipt and acceptance of the proposed design/review schedule.

7.2 Government Review Period. After receipt, the Government will be allowed thirty (30) calendar days to review and comment on each design submittal. The review will be for conformance with the technical requirements of the solicitation and the Successful Offeror's (Contractor's) RFP proposal. If the Contractor disagrees technically with any comment or comments and does not intend to comply with the comment, he must clearly outline, with ample justification, the reasons for noncompliance within seven (7) calendar days after receipt of these comments in order that the comment can be resolved. The Contractor shall provide and respond to all comments in DrChecks. The Contractor is cautioned in that if he believes the action required by any comment exceeds the requirements of this contract, that he should take no action and notify the COR in writing immediately. Review conferences will be held for each design submittal at a location to be furnished by the Contractor. The Contractor shall bring the personnel that developed the design submittal to the review conference. These conferences will take place the week after the receipt of the comments by the Contractor.

7.3 All documents submitted will be reviewed by the Government. Review comments will be issued to the A-E, indicating changes or other action required. All revisions shall be incorporated into the documents as required by review comments unless adequate justification is furnished to the Government indicating reason such actions or changes constitutes a change in the scope of work of this task order.

7.4 All review comments shall be resolved and annotated with the intended actions by the A-E. In cases of unsatisfactory compliance or resolution of comments, design documents will be returned to the A-E for correction.

7.5 DrChecks. After award of the task order, the A-E shall contact Resource Center Enterprises (1-800-428-4357) to register their firm and all sub-consultants in DrChecks (electronic government review system). Each firm will receive a registration key. Once the key is received, any individual from that firm will be able to register in DrChecks. The A-E will be responsible for accessing DrChecks to obtain review comments and provide annotated responses for this project at [www.projnet.org](http://www.projnet.org). The A-E shall check and incorporate any applicable Honolulu District Design Quality Lessons learned (DQLL) into the design of this project.

7.6 Post review conference action. Copies of comments, annotated with comment action agreed on, will be made available to all parties before the conference adjourns. Unresolved problems will be resolved by immediate follow-on action at the end of conferences. Valid comments will be incorporated. After receipt of final (100%) corrected building design documents upon incorporation of backcheck comments the contractor may proceed with site and building development activities within

the parameters set forth in the contract and accepted design submittal. The Government, however, reserves the right to disapprove design document submittals if comments are significant (in the opinion of the Government, it does not comply with the contract documents nor the level of quality implied). If pre-final or final submittal(s) are incomplete or deficient, and require correction by the Contractor and re-submittal for review, the cost of rehandling and reviewing will be deducted from payment due the Contractor at the rate of \$ 5,000.00 per submittal.

## 8.0 DESIGN ANALYSIS

8.1 Media and Format. Present the design analysis on 8-1/2-inch by 11-inch paper except that larger sheets may be used when required for graphs or other special calculation forms. All sheets shall be in reproducible form. The material may be typewritten, hand lettered, handwritten, or a combination thereof, provided it is legible. Side margins shall be 1-inch minimum to permit side binding and head to head printing. Bottom margins shall be 1-1/4-inches, with page numbers centered 1 inch from the bottom.

8.2 Organization. Assign the several parts and sheets of the design analysis a sequential binding number and bind them under a cover indicating the name of the facility and project number, if applicable. The title page shall carry the designation of the submittal being made. The complete design analysis presented for final review with the final drawings and specifications shall carry the designation "FINAL DESIGN ANALYSIS" on the title page.

8.3 Design Calculations. Design calculations are a part of the design analysis. When they are voluminous, bind them separately from the narrative part of the design analysis. Present the design calculations in a clean and legible form incorporating a title page and index for each volume. Furnish a table of contents, which shall be an index of the indices, when there is more than one volume. Identify the source of loading conditions, supplementary sketches, graphs, formulae, and references. Explain all assumptions and conclusions. Calculation sheets shall carry the names or initials of the author and the checker and the dates of calculations and checking. No portion of the calculations shall be computed and checked by the same person.

8.4 Automatic Data Processing Systems (ADPS). When ADPS are used to perform design calculations, the design analysis shall include descriptions of the computer programs used and copies of the ADPS input data and output summaries. When the computer output is large, it may be divided into volumes at logical division points. Precede each set of computer printouts by an index and by a description of the computation performed. If several sets of computations are submitted, a general table of contents in addition to the individual indices shall accompany them. Preparation of the description, which must accompany each set of ADPS printouts, shall include the following:

1. Explain the design method, including assumptions, theories, and formulae.
2. Include applicable diagrams, adequately identified.
3. State exactly the computation performed by the computer.
4. Provide all necessary explanations of the computer printout format, symbols, and abbreviations.
5. Use adequate and consistent notation.
6. Provide sufficient information to permit manual checks of the results.

## 9.0 DRAWINGS

9.1 General. Prepare all drawings on Computer-Aided Design and Drafting (CADD) so that they are well-arranged and placed for ready reference and so that they present complete information. The Contractor shall prepare the drawings with the expectation that the Corps of Engineers, in the role of supervision, will be able to construct the facility without any additional assistance from the Contractor. Drawings shall be complete, unnecessary work such as duplicate views, notes and lettering, and repetition of details shall not be permitted. Do not show standard details not applicable to the project, and minimize unnecessary wasted space. Do not include details of standard products or items, which

are adequately covered by specifications on the drawings. Each Design Discipline shall provide a complete list of abbreviations and symbols used in their respective drawings. Detail the drawings such that conformance with the RFP can be checked and to the extent that shop drawings can be checked. Do not use shop drawings as design drawings. The design documents shall consist of drawings on a 36" x 24" format. The Contractor shall use standard Corps of Engineers title blocks and borders on all drawings. Submit an index of drawings with each submittal. The COR will furnish the Contractor file, drawing, and specification numbers for inclusion in the title blocks of the drawings.

9.2 Methods and Format. Create all drawings using CADD methods in MicroStation format. Save all Design Complete CADD files as MicroStation 8.0 or latest. The Contractor shall use EM 1110-1-1807 Standards Manual for U.S. Army Corps of Engineers Computer-Aided Design and Drafting (CADD) Systems as guidance to for standard details, cell libraries, title blocks, and layer/level assignments. Drawing features not addressed in EM 1110-1-1807 shall conform to drafting standards.

9.3 Use of Standard Fonts. Only standard fonts provided by MicroStation shall be used in the creation of CADD files. No fonts created by third parties or the designers are permitted.

9.4 Use of Reference Files. The uses of Reference files and Xrefs during the design stage are up to the discretion of the designers. All CADD files at Design Complete submittal shall be free standing, independent files, and not supported by reference files. All Reference files (MicroStation) shall be removed at Design Complete submittal.

9.5 Submittal Media. Submit all Design Complete CADD files on the following media.

-Read/Write CD-ROM Disk

## 10.0 SPECIFICATIONS

10.1 General. The Contractor shall submit marked-up and final specifications as required. The specifications may be any one of the major, well known master guide specification sources such as MASTERSPEC from the American Institute of Architects, SPECTEXT from Construction Specification Institute or Unified Facilities Guide Specifications (UFGS), etc. unless otherwise required. Use only one source for the project unless otherwise required. Edit the specifications for this project and submit in marked-up or redlined draft version at the Pre-Final Review submittal stage. If the design is based on a specific product, the specification shall consist of the important features of the product. The specification shall be detailed enough such that another product meeting the specification could be substituted and it would not adversely impact the project. After incorporation of comments, submit a final, design complete specification package. Delete all marked-out or redlined text and type in all inserted text.

10.2 Submittal Register. Develop the submittal requirements during construction during the design phase of the contract, by producing a Contractor Submittal Register during design. Attach a submittal register to each section of the specifications for the submittal requirements of that section. Prepare the Submittal Register on ENG Form 4288. The Contractor shall be responsible for listing all required submittals necessary to insure the project requirements are complied with. The Register shall identify submittal items such as shop drawings, manufacturer's literature, certificates of compliance, material samples, guarantees, test results, etc that the Contractor shall submit for review and/or approval action during the life of the construction contract. The Contractor shall place all the Submittal Register pages in an appendix of the final specifications.

## 11. CONTENTS OF 50% DESIGN SUBMITTAL

The 50% design submittals shall contain as a minimum, the following:

### 11.1 Paving, Grading and Drainage

11.1.1 Explanation of objectives and factors influencing siting decisions.

General overview of major site features planned, such as building orientation, drainage patterns, parking provisions, traffic circulation, provisions for the handicapped, security requirements, etc. Rationale for locating major site elements. Set back requirements or specific clearance requirements. Locations of borrow and spoil areas.

11.1.2 Requirements for flood protection. Selected storm drainage plan with respect to existing storm drainage system. Alternate schemes considered in arriving at selected plan. Disposition of storm water collected in the new system. Planned connections to the existing storm drainage system. Handling of roof runoff. Features and locations of special drainage structures. Types of materials to be specified for each installation. Selected design values to be used in the storm drainage calculations such as surface runoff coefficient, retardance coefficient, infiltration rate, and rainfall intensity based on a 10-year storm frequency. Design flood frequency and minimum elevation to provide flood protection. Planned finished floor elevations.

11.1.3 Slope stability analysis (cut and fill) and justification for any slopes steeper than 3:1 for cohesive soils and 4:1 for cohesionless soils.

11.1.4 Pavement design analysis shall include design method and all pertinent data including traffic types, volumes, soils data and any other data used to design the pavement structures. Flexible Pavements--required thickness of base and pavement based on the pavement design and established subgrade CBR. Rigid Pavements--required thickness of nonreinforced concrete pavement and the established modulus of subgrade reaction.

11.1.5 Traffic volume and type. Particular AASHTO design vehicles for which turning movements are to be provided for and corresponding minimum turning radius.

11.1.6 Requirements for curbs, sidewalks, guardrails, traffic signs, markings, fencing, etc. Intersections or connections to existing roads and streets. Traffic routing during construction.

11.1.7 Site plan (geometry) and grading and drainage plan.

11.1.8 An overall site plan on one drawing showing all paving, grading and drainage.

11.1.9 Permit applications.

11.2 Geotechnical. A geotechnical report and design analysis.

11.3 Water Supply and Sanitary Sewage.

11.3.1 Design narrative and design calculations for the water supply and wastewater systems relating to this project. Include an analysis of the existing water distribution system capability to supply sufficient quantity at adequate pressures for fire protection. If the existing water distribution system is inadequate, provide the design solution to augment the water supply to meet the fire protection requirements. Design for wastewater systems shall show sewage flows, pipe sizes, routing, elevations, pump type and capacities, wet well sizing, etc. The Contractor shall present an analysis presenting proposed corrections of deficiencies or confirming the adequacy of the existing water supply system to support the proposed building.

11.3.2 Drawings developed to the point of showing in plan the anticipated systems and layout. Rough details of pumping systems or other features requiring detail drawings.

11.3.3 Anticipated permit requirements for water and wastewater features.

11.3.4 Lawn and Landscaping Irrigation System.

The design submittal shall include drawings clearly showing the piping layout and location of sprinkler

heads coordinated with the landscaping plan, control valves, backflow preventers, rain check switches, controllers, etc. Indicate buildings, walks, shrubbery, trees, and other obstacles that might interfere with the proper operation of the sprinkler system. A design analysis calculating the pressures at each sprinkler head for the capacity and radius of throw is required. Details of the sprinkler head installation, valve boxes, and other irrigation appurtenances shall be submitted.

#### 11.4 Landscape, Planting and Turfing.

11.4.1 The landscape planting design narrative shall describe the analysis of existing site conditions, including an indication of existing plant materials that are to remain on the site. The statement of concept shall indicate specific site problems related to proposed development and the rationale for proposed plant locations. The narrative shall also include a list of suggested types and sizes of plant materials which are to be used, based upon the designated functional and visual criteria.

11.4.2 The concept drawings shall be prepared at a scale which corresponds with the site layout and grading plans and, likewise, shall include reference coordinates, north arrows, graphic scales and appropriate legends. An overall planting layout shall be developed and shall include enlarged detail plans of specific areas, as needed, to clarify requirements. The proposed layout shall indicate shade trees, evergreen trees, flowering trees, shrub masses, etc., according to designated functional and visual locations of planting. A legend which also indicates sizes of plants recommended for each of the above categories shall be included. The drawings and all subsequent plans shall indicate existing and proposed buildings, paved areas, signs, light standards, transformers, dumpster areas, storm drainage system, and other structures and utilities.

#### 11.5 Architectural

11.5.1 Design narrative shall provide a summary of functional space relationships, as well as circulation. There shall also be a general statement for the rationale behind the major design decisions.

11.5.2 Plans shall indicate dimensions, columns lines, and detail references. Toilets and other specialized areas shall be drawn to 1/4" scale and shall show any needed interior features.

11.5.3 Finish schedule shall indicate material, finishes, colors and any special interior design features such as soffits, fascias, and lighting troughs, etc.

11.5.4 All required equipment shall be shown on the drawings with an equipment list.

11.5.5 List any special graphics requirements that will be provided.

11.5.6 Schedules shall be provided for both doors and windows. These schedules shall indicate sizes, types, and details for all items shown on floor plans.

11.5.7 Hardware sets using Builders Hardware Manufacturers Association Inc. (BHMA) designations.

11.5.8 Composite floor plan showing all prewired workstations or kitchen equipment. Also show typical elevations of each type of workstation or equipment.

11.5.9 Comprehensive Interior Design (CID) package.

11.5.10 List all references used in the design including but not limited to Government design documents and industry standards.

11.5.11 Specifications: The architectural work for the project shall be constructed in accordance with Unified Facilities Guide Specifications (UFGS). Edited UFGS specification sections shall clearly indicate design intent including products and execution to be provided.



#### 11.6. Structural Design.

11.6.1 State the live loads to be used for design. Include roof and floor loads; wind loads, lateral earth pressure loads, seismic loads, etc., as applicable.

11.6.2 Describe the method of providing lateral stability for the structural system to meet seismic and wind load requirements. Include sufficient calculations to verify the adequacy of the method.

11.6.3 Furnish calculations for all principal roof, floor, and foundation members.

11.6.4 This submittal shall include drawings showing roof and floor framing plans as applicable. Principal members will be shown on the plans. A foundation plan shall also be furnished showing main footings and grade beams where applicable. Where beam, column, and footing schedules are used, show schedules and fill in sufficient items to indicate method to be used. Typical sections shall be furnished for roof, floor, and foundation conditions. Structural drawings for proposals and submittals shall be separate from architectural drawings.

11.6.5 Provide any computer analyses used shall be widely accepted, commercially available programs or complete documentation.

11.6.6 Antiterrorism/Force Protection (AT/FP) and Seismic Evaluation and Rehabilitation. The design analysis provided in the proposal submission shall be further developed. Complete the Government-furnished designs on AT/FP and seismic hazards mitigation, and provide detailed drawings reflecting the completed designs. Designs shall be stamped by a structural engineer licensed in the U.S.

11.6.7 A narrative description and supporting calculations shall show structural adequacy of existing structure to support new live loads. If existing floor systems will require strengthening to maintain structural integrity, provide an analysis and complete and detailed drawings showing the work.

#### 11.7 Specific Mechanical and Plumbing Requirements:

11.7.1 List all references used in the design including Government design documents and industry standards.

11.7.2 Provide justification and brief description of the types of equipment, fixtures and piping materials proposed for use. Descriptions shall include narrative and catalog cuts.

11.7.3 Prepare detail calculations for systems such as sizing of air conditioning systems, heat recovery system, gas hot water heater and piping, and storage tanks.

11.7.3.1 Include computations for sizing equipment, air duct design, and U-factors for ceilings, roofs and exterior walls and floors. Contractor shall employ commercially available energy analysis techniques to determine the energy performance of all passive systems and features. Use of hourly energy load computer simulation (e.g., HAP, Trace, TRNSYS, DOE 2.1 Blast, etc.) is required. These calculations can be used to size the mechanical systems. Based on the results of calculations, provide a complete list of the materials and equipment proposed for heating and plumbing, with the manufacturer's published cataloged product installation specifications and roughing-in data. The heating and cooling equipment data shall include the manufacturer's wiring diagrams, installation specifications, ARI certification, and the standard warranty for the equipment.

11.7.4 include drawings of all areas including air conditioning, hot water, cold water, waste and vent piping. Drawings shall include plans, sections, piping isometric diagrams, control diagrams, DDC points list, sequence of operation, schedules and details. Minimum of 1:100 scale shall be used on all plan drawings, and building sections. Detailed drawings shall be minimum 1:50 scale. Detailed

drawings shall be provided for all mechanical spaces including, but not limited to, toilet areas, mechanical rooms, chiller plant, hot water plant and fire pump building. Minimum drawing requirements are as follows:

Room designations.

Mechanical legend and applicable notes.

Location of all ductwork or piping

Location and capacity of all terminal units (i.e., registers, diffusers, grilles, variable air volume boxes).

Exhaust fan and range hood location.

Size of all ductwork 400 mm (16 in.) or larger in any dimension and piping 100 mm (4 in.) or larger

Location of heating/cooling plant (i.e., boiler, chiller, cooling tower, etc).

Location of all air handling equipment.

Return air paths (i.e., undercut doors, transfer grilles).

Flue piping size and location.

Fixture schedule and designations

Location of utility entrances.

Waste and water pipe location and size.

Details of any building penetration (i.e. louvers, penthouses, powered roof ventilators, vents, etc.)

11.7.4.1 Equipment Schedule: Complete equipment Schedules shall be provided. Schedule shall include at minimum:

Capacity

Electrical characteristics

Efficiency (if applicable)

Manufacturer's name

Optional features to be provided

Physical size

Weight

11.7.6 Specifications: The mechanical and plumbing work for the project shall be constructed in accordance with Unified Facilities Guide Specifications (UFGS). Edited UFGS specification sections shall clearly indicate design intent including products and execution to be provided.

## 11.8 Fire Protection

11.8.1 Design documents: All Fire Protection Design documents shall be in accordance with ER 1110-345-700 and are required to be submitted for approval prior to start of construction. Fire protection symbols in NFPA 170 shall be used. See Scope of work, Chapter 12 for acronym definitions used in this paragraph.

11.8.2 Fire Protection Analysis is required to be submitted in accordance with UFC 1-200-01 and UFC 3-600-1. Requirement must be stated with what is being provided in the project to meet this requirement. Include proposal submittal and the following: Hydraulic analysis and node sketch for all sprinkler systems to be installed in all buildings in accordance with FSC and UFC. Calculations confirming the adequacy of the existing water supply shall be provided. Hydrant flow test is required and flow data shall be submitted. Hydrant flow test shall be performed with the Schofield Barracks Water Treatment Plant clearwell pumps off. Calculations for any fire pump and tank shall be provided. Locations of all fire pumps and tanks shall be shown. All IBC allowable area, allowable height, construction type to be used and location on property requirements shall be submitted. Fire alarm system type (addressable) to be discussed. Discussion of all the life safety requirements of LSC shall be included.

11.8.3 Fire Protection Drawings:

11.8.3.1 General: Minimum of 1:100 scale shall be used on all plan drawings, and building sections. Drawings shall show fire alarm systems, sprinkler system and life safety requirements (fire barriers, exits, etc.). Detail drawings shall be minimum 1:50 scale. Minimum drawing requirements are as follows:

11.8.3.2 Automatic Fire Sprinkler system: Sprinkler head plans, attic plans, building sections, sprinkler riser with shutoff valve and tamper switch, alarm check valve, preaction/deluge valve, local alarm gong, flow/pressure switch, wall penetrations, fire rated wall penetrations, fire department connection locations, and sprinkler design parameters (occupancy hazard for each room, minimum sprinkler density to be used for each occupancy hazard, minimum design area, most hydraulically remote area, sprinklered areas). Detail fire pump plans, sections, isometric diagram of the fire pump system, tank plans, tank sections, tank details and piping layout and details.

11.8.3.3 Fire alarm system: Plans showing location of all initiation devices (manual pull stations, duct smoke detectors, sprinkler flow switches, smoke detectors, magnetic door holders), visible/audible notification appliances, supervisory devices (tamper switches, low pressure switches), fire alarm panel, fire alarm exterior annunciator, and fire alarm diagram.

11.8.3.4 Life Safety: All fire rated walls shall be shown where they begin and where they end. All fire rated shafts, stairs, vertical openings, seismic joints shall be shown. Fire rated doors, fire rated door frames, fire rated windows and window frames, door hardware, fire dampers, and smoke dampers are to be shown with the appropriate fire rating in hours.

11.8.3.5 IBC requirements: Site plan showing the location of the project buildings in relation to other existing buildings, roads, parking lots, fuel tanks, water tanks, electric poles, exterior power lines.

11.8.3.6 Means of egress lighting and LED type exit signs meeting LSC shall be shown on the plans.

#### 11.8.4 Specifications.

11.8.4.1 General requirements: The fire protection work for the project shall be constructed in accordance with Unified Facilities Guide Specifications (UFGS) sections 13920 Fire Pumps, 13930 Wet Pipe Sprinkler System, Fire Protection, 13945 Preaction/Deluge Sprinkler System, Fire Protection, 13851 Fire Detection and Alarm System Addressable, and 7840 Firestopping. Edited UFGS specification sections shall be used and revised in accordance with the restrictions in ER 1110-345-700, Appendix D and the following:

11.8.4.2 Sprinkler systems: No plastic piping or fittings, and "T drill method" are allowed. Sprinkler system design area, density and hydrant demand shown in 1008C shall be followed. Sway bracing and branch restraints are required. Government Shop drawing submittal approval and preparer approval is required.

11.8.4.3 Fire alarm systems: Class A looped fire alarm system is required. "T taps" are prohibited. Fire Protection Engineer qualification approval, Fire Protection Engineer shop drawing approval and fire alarm shop drawing submittal approval by the Government are required. Modify the operations paragraph to meet the Attachment Fire Alarm Control Matrix control sequence.

11.8.4.4 Firestopping, fire dampers, fire rated doors/door frames, smoke dampers, and exit signs, must be submitted for Government approval.

#### 11.9 Interior Electrical System

11.9.1 The power riser or one-line diagram shall be essentially complete except for finalization of conduit and wire sizes.

11.9.2 Panelboards, switchboards, switchgear, motor control centers, and all other utilization

equipment shall be located on the floor plans. Schedules for applicable equipment shall be provided. The schedules shall include all pertinent information to fully describe the equipment. Elevations for free standing equipment shall be provided but need not be entirely finalized.

11.9.3 Details of the layouts for electrical closets and rooms shall be shown.

11.9.4 Receptacles and light fixture layouts (wiring not required at this stage) shall be shown for all rooms.

11.9.5 Areas where nonlinear loads will be encountered shall be identified. Per the requirements of paragraphs 4c and 4g of ETL 1110-3-403, the use of 75 degree C. (minimum) conductors is required. Branch circuits serving eight-wire systems furniture or groups of nonlinear loads shall be 3#12, 1#10 N., 1#12 GND. and 1#12 Isolated GND. Feeders serving panelboards with nonlinear loads shall have the neutral conductor ampacity based on at least 1.73 times the ampacity of the phase conductors. The neutral bus in the panelboards shall have the same criteria. The simplest way to accomplish the upsizing of the neutral conductor is to provide double ampacity neutrals or parallel conductors in sizes permitted by the National Electrical Code.

11.9.6 A completed fixture schedule shall be included on the drawings.

11.9.7 All removals shall be shown on demolition plans.

11.9.8 Describe energy conservation measures and/or techniques that are being incorporated into the design.

#### 11.10 Exterior Electrical Distribution System

11.10.1 In a narrative, clearly describe the electrical distribution system and state the changes to be made to the existing system to accommodate this project. State any deficiencies to be corrected and provide a description of all new work being performed.

11.10.2 State the electrical characteristics of the power supply from the service point to the main service equipment.

11.10.3 Indicate the type, number, voltage rating and connections, and kVA rating of all transformers provided.

11.10.4 State the type of conductor to be used and provide a justification for its use.

11.10.5 Include a statement describing the criteria used for the exterior design such as primary and secondary voltage drop. Describe the physical characteristics of both the underground and overhead power lines. Provide the short circuit current available at the site and state the source of this value.

11.10.6 Include a description of all exterior lighting systems included in the design. Identify the fixture types, poles and design lighting levels. Provide point-to-point calculations showing that all design levels have been achieved.

11.10.7 The exterior electrical design drawings shall show all poles (lighting), underground conductors, manholes, handholes, ductbanks, and all pertinent components identified on the site plans.

11.10.8 All removals shall be shown on demolition plans.

#### 11.11. Electronic Systems

##### Public Address System

Telecommunications System  
Cable Television System  
Intrusion Detection  
Personal Alert (Mass Notification) System

Provide a descriptive narrative of all electronic systems that are required for this project. The design analysis shall include all calculations required to support design decisions and estimates at this stage of design. The analysis shall include specific criteria furnished, conference minutes and cost analyses of all systems considered.

11.11.1. Show location of telecommunications outlets (including pay phones) on the plans. Include legend and symbol definition to indicate height above finished floor. Show a Telecommunication Conduit System Riser Diagram.

11.11.2. Verification of the validity of any existing drawings and/or any other data furnished by the Government shall be the responsibility of the engineering services firm.

11.11.3. Provide a statement describing the extent of any exterior work such as telecommunication lines, cable television (TV) distribution cables, duct banks, etc., outside of 5 feet from the building line.

11.11.4. Exterior work to be shown on electrical site plan:

Existing and new telecommunications and cable television service lines, both overhead and underground, shall be properly identified.  
Show removals and relocations, if any.

11.11.5. Show the location of all electronic system panels, devices, outlets, etc., on the floor plans. Show the proposed riser diagrams for all systems. Provide a complete symbol legend for all devices or equipment shown on the plans. For work requiring removals or demolition, the designer shall show how demolition work is to be done.

11.12. Submit outline specifications unless otherwise indicated above.

11.13. Submit the SPIRIT rating sheet for sustainable level compliance as indicated in the SOW.

## **12.0 CONTENTS OF 90% DESIGN SUBMITTAL**

12.1 General: The pre-final (90%) drawings are an extension of the reviewed 50% drawings and are to include the 50% comments and responses.

12.1.2 Design Analysis. The pre-final Fire Protection and Life Safety Analysis shall be included in the Design Analysis. The design analysis is an extension of the reviewed 50% design analysis and supports and verifies the design complies with the requirements of the project.

12.1.3 Drawings. The pre-final (90%) drawings are an extension of the review 50% drawings and include all revisions incorporated from the 50% review comments.

12.1.4. Provide pre-final (90%) marked up specifications. The Contractor shall submit all specification sections to be used clearly indicating what products and execution to be used in the final design.

12.1.5 Comment Response Package: Complete package showing all comments from all previous reviews and the respective response and disposition.

12.2 The site/utility portion of the 90% design submittal shall contain as a minimum, the following:

12.2.1 General Narratives:

12.2.1.1 Site/Layout: Explanation of objectives and factors influencing siting decisions. General overview of major site features planned, such as building orientation, drainage patterns, parking provisions, traffic circulation, provisions for the handicapped, security requirements, etc. Rationale for locating major site elements. Set back requirements or specific clearance requirements. Locations of borrow and spoil areas.

12.2.1.2 Utility Systems: Design narrative for the water supply, storm drainage, wastewater, electrical, and telecommunications systems relating to this project. Include an analysis of the existing distribution systems capability to supply sufficient quantity at adequate levels. If the existing distribution systems are inadequate, provide the design solution to augment the systems to provide the requirements for the new facilities.

12.2.2 All drawings included in the required technical data for the proposal submission (see SECTION 01010: STATEMENT OF WORK), shall be developed to 90 percent completion. In addition to the individual utility plans, submit a combined utility plan drawn to the same scale as the individual utility plans.

12.2.2.1 General Site Layout: Label and tie down locations of new site elements (buildings, walks, curbs, new pavements surfaces, gutters, parking, trash enclosures, bicycle racks, etc.) Scale shall be included.

12.2.2.2 Site Grading and Drainage Plans: Show locations of all sediment basins, diversion ditches, and other erosion control structures. Indicate the approximate drainage areas each will service. Indicate the materials, construction and capacity of each structure. Include limits of landscaping and seeded areas. Provide building grade sections (at least one view per axis of building(s) and extended through grading limits). General site grading and drainage shall be indicated by contour lines with an interval of not more than approximately 0.5 m [1.5 feet].

12.2.2.3 Road Alignment Plans: Scale shall be no greater than as indicated in SECTION 01010: STATEMENT OF WORK and profiles showing pavement and shoulder widths, azimuths and curve data, limits of grading, and erosion control. The materials to be used shall be indicated.

12.2.2.4 Traffic Control Plan: Traffic routing and signage shall be in accordance with The Manual on Uniform Traffic Control Devices for Streets and Highways, U.S. Department of Transportation, Federal Highways Administration.

12.2.2.5 Sanitary Sewer and Water Plan: Scale shall be as indicated in SECTION 01010: STATEMENT OF WORK and profiles showing location and elevation of pipe, thrust blocks, manholes, valves connections, etc. Materials and construction of pipes, valves, valve boxes, sewage treatment systems and appurtenances shall be indicated. Specifications shall be provided.

12.2.2.6 Electrical Plan Requirements:

12.2.2.6.1 Required diagrams and details on Site Electrical and Telecommunications Drawings.

12.2.2.6.1.a. Off-Site Electrical and Telecommunications Distribution Plans:

12.2.2.6.1.b. Off-Site Primary Circuit Routing Plans:

12.2.2.6.1.c. Off-Site One Line Diagrams

12.2.2.6.1.d. Off-Site Details.

12.2.2.6.1.e. On-Site Electrical and Telecommunications Distribution Plans:

12.2.2.6.1.f. On-Site One Line Diagrams

12.2.2.6.1.g. On-Site Distribution Transformer Schedule: Provide with the following headings:

Transformer Designation. Transformer Size (KVA). Building(s) Served.

Primary Phase(s) and Circuit to which connected.

12.2.2.6.1.h. Details shall include but not limited to poles, manholes, handholes, ductbanks, site

lighting poles, trenching, pad-mounted transformers and switches, etc. Calculations shall support all new manhole and handhole locations.

12.2.2.6.2 See Chapter 9, Electrical Systems, for other design requirements.

12.2.2.7 Specifications: Provide pre-final draft marked-up specifications, which include all sections, which apply to site/utility work.

12.2.2.8 Design Analysis: Design analysis shall include design calculations fully developed to support the design of the site and utility systems included in this submittal.

12.2.2.9 Geotechnical: Soils analysis and geotechnical report. Geotechnical information must be provided to support all assumptions and design parameters utilized in the presented site/utility design as applicable.

12.3 The building and landscaping portion of the 90% design submittal shall contain as a minimum, the following:

12.3.1 Landscaping and Irrigation System: The design submittal shall include drawings clearly showing the piping layout and location of sprinkler heads coordinated with the landscaping plan, control valves, backflow preventers, rain check switches, controllers, etc. Indicate buildings, walks, shrubbery, trees, and other obstacles that might interfere with the proper operation of the sprinkler system. A design analysis calculating the pressures at each sprinkler head for the capacity and radius of throw is required. Details of the sprinkler head installation, valve boxes, and other irrigation appurtenances shall be submitted.

12.3.2 Landscape, Planting and Turfing

12.3.2.1 The landscape planting design narrative shall describe the analysis of existing site conditions, including an indication of existing plant materials that are to remain on the site. The statement of concept shall indicate specific site problems related to proposed development and the rationale for proposed plant locations. The narrative shall also include a list of suggested types and sizes of plant materials, which are to be used, based upon the designated functional and visual criteria.

12.3.2.2 The drawings shall be prepared at a scale which corresponds with the site layout and grading plans and, likewise, shall include reference coordinates, north arrows, graphic scales and appropriate legends. An overall planting layout shall be developed and shall include enlarged detail plans of specific areas, as needed, to clarify requirements. The proposed layout shall indicate shade trees, evergreen trees, flowering trees, shrub masses, etc., according to designated functional and visual locations of planting. A legend that also indicates sizes of plants recommended for each of the above categories shall be included. The drawings and all subsequent plans shall indicate existing and proposed buildings, paved areas, signs, light standards, transformers, dumpster areas, storm drainage system, and other structures and utilities.

12.3.3 Architectural

12.3.3.1 The architectural analysis, drawings and specifications shall include the 50% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 50% submittal based on comments on the 50% submittal. Architectural specifications must be complete with all edits incorporated in the specification text.

12.3.3.2 Details: Complete Construction details, sections, interior elevations, exterior elevations, etc., shall be provided to describe the methods and materials of design.

12.3.3.3 Pre-wired workstation composite floor plans. Pre-wired workstation typicals - elevations and

component inventory. Pre-wired workstation panel identification plan with electrical outlet placement including base feed.

12.3.3.4 Comprehensive Interior Design package shall include the 50% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 50% submittal.

#### 12.3.4 Structural Systems

12.3.4.1 State the live loads to be used for design. Include roof and floor loads; wind loads, lateral earth pressure loads, seismic loads, etc., as applicable.

12.3.4.2 Describe the method of providing lateral stability for the structural system to meet seismic and wind load requirements. Include sufficient calculations to verify the adequacy of the method.

12.3.4.3 Furnish calculations for all principal roof, floor, and foundation members.

12.3.4.4 This submittal shall include drawings showing roof and floor framing plans as applicable. Principal members will be shown on the plans. A foundation plan shall also be furnished showing main footings and grade beams where applicable. Where beam, column, and footing schedules are used, show schedules and fill in sufficient items to indicate method to be used. Show typical bar bending diagram if applicable. Typical sections shall be furnished for roof, floor, and foundation conditions. Structural drawings for proposals and submittals shall be separate from architectural drawings.

12.3.4.5 Provide any computer analyses used shall be widely accepted, commercially available programs and complete documentation of the input and output of the program.

12.3.4.6 Provide complete seismic analyses for all building structural components. Seismic calculations shall clearly demonstrate compliance with all requirements set forth in the Statement of Work.

#### 12.3.5 Specific Mechanical and Plumbing Requirements:

12.3.5.1 The mechanical and plumbing analysis, drawings and specifications shall include the 50% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 50% submittal based on comments on the 50% submittal. Mechanical and plumbing specifications must be complete with all edits incorporated in the specification text.

12.3.5.2 Details: Construction details, sections, elevations, etc., shall be provided where required for clarification of methods and materials of design. All roof and exterior wall penetrations shall be detailed on the drawings.

12.3.6 Fire Protection: The Fire protection analysis, drawings and specifications shall include 50% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 50% submittal based on comments on the 50% submittal. Fire protection specifications must be complete with all edits incorporated in the specification text.

#### 12.3.7 Electrical and Electronic Systems Requirements

12.3.7.1 The Electrical and Electronic systems design analysis, drawings, and specifications shall include the 50% submittal with corrections incorporated, including the annotated comments indicating what corrections were done on the 50% submittal based on comments on the 50% submittal. All requirements specified in the 50% submittal must be developed and completed to this 90% stage.

12.3.7.2 Electrical and Electronics Floor Plans. The floor plans shall show all principle architectural



features of the building, which will affect the electrical design. The floor plans shall also show (but not limited to) the following:

- Room designations.
- Electrical legend and applicable notes.
- Lighting fixtures, properly identified.
- Location of smoke detectors and fire alarm devices
- Location of telecommunication and cable TV outlets.
- Location of all electronic systems devices
- Switches for control of lighting.
- Receptacles.
- Location and designation of panel boards. Plans should clearly indicate type of mounting required (flush or surface) and be reflected accordingly in specifications. Service entrance (conduit and main disconnect).
- Location, designation and rating of motors and/or equipment which requires electrical service. Show method of termination and/or connection to motors and/or equipment. Show necessary junction boxes, disconnects, controllers (approximate only), conduit stubs, and receptacles required to serve the motor and/or equipment.
- All circuit wiring and cables (number and sizes)
- All conduit runs and sizes
- All riser and one line diagrams
- All other electrical and electronic equipment

12.3.7.3. Building Riser Diagram (from pad-mounted transformer to unit load center panel board): Indicate the types and sizes of electrical equipment and wiring. Include grounding and metering requirements.

12.3.7.4. Load Center and Panelboard Schedule(s): Schedule shall indicate the following information:

- Load Center/Panelboard Characteristics (Panel Designation, Voltage, Phase, Wires, Main Breaker Rating and Mounting)
- Branch Circuit Designations.
- Load Designations.
- Circuit Breaker Characteristics. (Number of Poles, Trip Rating, AIC Rating)
- Branch Circuit Connected Loads (AMPS).
- Special Features.

12.3.7.5 Lighting Fixture Schedule: (Schedule shall indicate the following information:)

- Fixture Designation.
- General Fixture Description.
- Number and Type of Lamp(s).
- Type of Mounting.
- Voltage
- Special Features.

12.3.7.6. Details: Details of all light fixtures shall be provided. Construction details, sections, elevations, etc., shall be provided where required for clarification of methods and materials of design.

12.3.7.7 Electrical and Electronic systems specifications must be complete with all mark-ups and edits incorporated in the specification text.

12.3.7.8 Design analysis and calculations for the electrical systems shall be prepared by a licensed professional engineer with experience and shall be stamped as such. The design analysis shall be separately bound, in one or more volumes. The design analysis shall include all calculations required to support design decisions, including (but not limited to) lighting calculations, voltage drop

calculations, load calculations (for transformers, conductor sizes, circuit breaker sizes, panelboard sizes, etc.), and short circuit calculations. The analysis shall also include specific criteria furnished, conference minutes, and cost analyses of all systems considered. Show functional and engineering criteria, design information, and calculations applicable to the project. The analysis shall be organized in a format appropriate for review, approval, and record purposes. The design calculations shall indicate methods and references identified, and shall explain assumptions and conclusions.

12.3.7.9. Voltage Drop (VD) Calculations: Provide voltage drop calculations of primary feeders, site lighting circuits, service laterals, feeder conductors, and selected branch circuits over 31m (100 ft) in length. Maximum allowable voltage drop for site lighting and service laterals is 3%. The combined voltage drop for the service laterals, unit feeders, and branch circuit cannot exceed 5%.

12.3.7.10 See Chapter 9, Electrical Systems, for other design requirements.

12.3.8 Kitchen Requirements: List all references used in the design including Government design documents and industry standards. Provide justification and brief description of the types of equipment, fixtures and piping materials proposed for use. Descriptions shall include narrative and catalog cuts. Prepare detail calculations for systems such as sizing of makeup air systems, exhaust systems, refrigeration equipment, kitchen equipment and gas piping. List of the materials and equipment proposed shall include the manufacturer's published cataloged product installation specifications and roughing-in data. The data shall include the manufacturer's wiring diagrams, installation specifications, certifications, and the standard warranty for the equipment. Include drawings of all areas. Drawings shall include plans, sections, piping isometric diagrams, control diagrams, sequence of operation, schedules and details. Minimum of 1:50 scale shall be used on all plan drawings, and building sections. The kitchen work for the project shall be constructed in accordance with Unified Facilities Guide Specifications (UFGS). Edited UFGS specification sections shall clearly indicate design intent including products and execution to be provided.

12.3.9 Sustainable Design: Provide a completed SPiRiT checklist to show compliance with the level indicated in the SOW and incorporated comments on the previous design submittal.

### 13.0 CONTENTS OF 100% DESIGN SUBMITTAL

13.1 General: A complete set of construction documents plans and specifications at the same level of detail as if the project were to be bid including a complete list of equipment, fixtures and materials to be used. The final (100%) drawings are an extension of the reviewed 90% drawings and are to include the 90% comments and responses. All details shall be shown on the drawings.

13.1.2 Complete design analysis for all design disciplines. The final Fire Protection and Life Safety Analysis shall be included in the Design Analysis. The design analysis is an extension of the reviewed 90% design analysis and supports and verifies the design complies with the requirements of the project.

13.1.3 The Final (100%) drawings are an extension of the review 90% drawings and include all revisions incorporated from the 90% review comments. Drawings shall be 100% complete, signed and sealed by the designer of record.

13.1.3. Provide Final (100%) specifications. The Contractor shall make final identification of all materials at this stage.

13.1.3 Comment Response Package: Complete package showing all comments from all previous reviews and the respective response and disposition.

13.1.3 Additional Requirements.

- a. Compliance Certification

(1) The Contractor shall certify that the features and standards offered in its submittals meet or exceed the corresponding mandatory features and standards stated in the Scope of Work. A certification to this effect shall be included on the title sheet of each submittal made under this section. The certification shall be signed by the person(s) authorized to bind the offeror under the offer, or by persons who have been delegated, in writing such authorization.

(2) The parties understand that, at the time of award, all features and standards proposed in the Contractor's accepted offer, including the mandatory requirements of the RFP, as amended by the Contractor's accepted offer, become binding upon both the Government and the Contractor. Deviations from the features and standards of the accepted offer, including deviations from the RFP's mandatory requirements, as amended by the accepted offer, may be approved by the Contracting Officer upon written application by the Contractor and agreement as to good and sufficient consideration by the parties, reflected in an equitable adjustment to the contract price.

b. Field Inspection. The Contractor shall verify field conditions, which are significant to design, by field inspection, researching and obtaining all necessary as-built drawings and reproducing them for his own use as necessary, and discussing status with knowledgeable personnel. The information shall be reflected in the design documents.

c. Additional Topographic Information. The Government has supplied all or a majority of the topographic information required for the project as part of the topographic survey sheets provided in the Request for Proposals drawings. Any additional topographic information required by the Contractor for design after award of the contract shall be procured and paid for by the successful Proposer.

d. Soil and Foundation Report. A final and complete soil and foundation report shall be furnished by the Contractor in accordance with Site Engineering Section of the Statement of Work.

13.2 The building and landscaping design portion of the 100% design submittal shall contain, as a minimum, the following items for all submittals:

13.2.1 Landscape and Planting Final design drawing(s) shall include a complete schedule of plant materials which indicates their botanical and common names, plan symbols, quantities, sizes, condition furnished, and pertinent remarks. The drawings shall be prepared at a scale that corresponds with the site layout and grading plans and, likewise, shall include reference coordinates, north arrows, graphic scales and appropriate legends. An overall planting layout shall be developed and shall include enlarged detail plans of specific areas as needed, to clarify requirements. Final design drawings, indicating proposed plants by a (+) mark for the plant location and a circle which is scaled at approximately 2/3 the ultimate growth spread (diameter) of plants, shall also include a complete schedule of plant materials which indicates botanical and common names, plan symbols, quantities, sizes, condition furnished, and pertinent remarks. Final drawings shall also include the basic details for installation of tree, shrub, and ground cover planting, as well as any other applicable details for clarification of specific project requirements.

#### 13.2.2 Architectural

13.2.3.1 The architectural analysis, drawings and specifications shall include the 90% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 50% submittal based on comments on the 90% submittal. Architectural specifications must be complete with all edits incorporated in the specification text.

13.2.3.2 All architectural drawings shall be coordinated with the other engineering disciplines. Ensure that the plans are in compliance with the applicable codes. It will be the Contractor's responsibility to implement the comments generated from any design review submittal as well as verify the consistency between plans and specification. The evaluation of the Contractor's submittals shall be based on

degree to which the submittal meet the requirements set forth in this document and the specifications.

13.2.3.4 Comprehensive Interior Design package shall include the 90% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 90% submittal.

#### 13.2.4 Structural Design

13.2.4.1 Furnish complete checked calculations for all structural members. Incorporate any changes required by comments on 90% Design Submittal.

13.2.4.2 Prior to this submittal, structural drawings shall be coordinated with all other design disciplines.

13.2.4.3 The final structural drawings shall contain the following information as a set of general notes:

The allowable soil bearing value.

The design stresses of structural materials used.

The design live loads used in the design of various portions of the structures.

The design wind speed.

The seismic acceleration coefficients, seismic use group, and performance level criteria used in design.

13.2.4.4 All structural drawings and calculations shall be checked and stamped by the designer of record (a registered Professional Engineer).

#### 13.2.5 Specific Mechanical and Plumbing Requirements:

13.2.5.1 The mechanical and plumbing analysis, drawings and specifications shall include the 90% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 90% submittal based on comments on the 90% submittal. Mechanical and plumbing specifications must be complete with all editions incorporated in the specification text.

13.2.5.2 In addition to items submitted in the paragraph 11.4.7.1, the drawings shall be revised to include:

Double line ductwork

Double line piping for all piping 100 mm (4 in.) or larger on 1:50 drawings

Double line piping for all piping 200 mm (8 in.) or larger on 1:100 drawings

Thermostat locations

Size of all ductwork

Size of all piping

All details

13.2.5.3 Details: Construction details, sections, elevations, etc., shall be provided where required for clarification of methods and materials of design. All roof and exterior wall penetrations shall be detailed on the drawings.

13.2.6. Fire Protection: The Fire protection analysis, drawings and specifications shall include 90% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 90% submittal based on comments on the 90% submittal. Fire protection specifications must be complete with all editions incorporated in the specification text.

#### 13.2.7 Specific Electrical and Electronic Requirements:

13.2.7.1 The Electrical and Electronic systems design analysis, drawings, and specifications shall

include the 90% submittal with corrections incorporated, including the annotated comments indicating what corrections were done on the 90% submittal based on comments on the 90% submittal. All requirements specified in the 90% submittal must be developed and completed to this 100% stage.

13.2.8 Kitchen Requirements: The kitchen design analysis, drawings and specifications shall include the 90% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 90% submittal based on comments on the 90% submittal. Mechanical and plumbing specifications must be complete with all editions incorporated in the specification text.

13.2.9 Specifications: Provide final specifications. The Contractor shall make final identification of all materials and finishes at this stage.

13.2.10 Sustainable Design: Provide a revised completed SPiRiT checklist to show compliance with the silver level of the SPiRiT checklist due to changes in the design from the 90% submittal to the 100% submittal.

#### 14.0 DESIGN RELATED PRODUCTS

14.1 Architectural Renderings: Contractor shall provide the original and three copies of each ground level perspective artist's renderings of completed typical facilities with walks, parking, and landscaping. Renderings shall be no smaller than 14" x 18" or larger than 28" x 36", multi-colored, and shall be suitably titled, matted, and framed.

14.2 DD Form 1354: Three (3) sets of DD Form 1354, Transfer and Acceptance of Military Real Property shall be prepared in accordance with ER 415-345-38 and submitted to the Contracting Officer.

14.3 Reproduction: Upon Government approval of 100% design documents, the original will be returned to the Contractor for reproduction purposes. The Contractor will be responsible for his own reproduction as well as reproduction for Government use. The Government will require the same number of copies of the plans and specifications as were required for the review stages, no color boards will be required. The originals will be retained by the Contractor for recording of as-built conditions. Upon completion of the project, the original design documents corrected to reflect as-built conditions will be supplied to the Government.

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## SECTION 01900

### MISCELLANEOUS PROVISIONS

#### PART 1 GENERAL

##### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

##### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 240	(1993) Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
24 CFR 35	Lead-Based Paint Poisoning Prevention in Certain Residential Structures
29 CFR 1910.1001	Asbestos, Tremolite, Anthophyllite, and Actinolite
29 CFR 1926.1101	Asbestos, Tremolite, Anthophyllite, Actinolite
40 CFR 763	Asbestos
40 CFR 745	Lead; Requirements for Lead-Based Paint Activities

##### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

##### SD-01 Pre-Construction Submittals

##### Organization Plan; G.

Provide a diagram depicting the proposed management organization. The chart shall clearly identify lines of authority and areas of responsibility. Include a narrative description of how the management team will operate, and the specific duties and responsibilities of the key individuals.

The narrative shall describe the Offeror's proposed on-site organization and structure, and shall describe how the Offeror intends to monitor and control timeliness, quality, and safety of

the work at the job site, including the work of any subcontractors on all phases of the contract.

Identify the individuals proposed to fill the key management positions: Project Manager, Project Superintendent, Contractor Quality Control System Manager, Design Quality Control Manager, Safety and Health Manager. Provide resumes for each individual. Resumes must support the individual's qualifications to perform in the selected position.

Provide copies of letters of direction to each key personnel from an appropriate officer of the company.

If the information submitted in proposal Volume I, Factor III is current and complete, submit one copy of this information. However, if any of the proposal information is not current or requires revision, in addition to the copy of the proposal information, submit four copies of all additions and changes for Contracting Officer acceptance.

Accident Prevention Plan. G.

Activity Hazard Analyses, G.

#### SD-03 Product Data

Equipment Data.

A list of all equipment furnished under this contract. This list shall include, but not be limited to, each piece of equipment with a serial number, and shall include all information shown on the manufacturer's nameplate, so as to positively identify the piece of equipment. This list shall also include the cost of each piece of equipment (less installation costs) F.O.B. construction site. This list shall be furnished as soon as possible after equipment is purchased. The list shall consist of one (1) reproducible and three (3) copies, and shall be furnished to the Contracting Officer not later than thirty (30) calendar days prior to completion of any segment of the contract work that has an incremental completion date.

Recovered Material Report

The Contractor shall provide a report listing all products meeting EPA guidelines for products containing recovered materials and quantity used for this project.

#### SD-06 Test Reports

Inspection of Existing Conditions.

A written report with color photographs noting the condition of the existing facilities at the time of the inspection. One copy of the report including photographs shall be submitted to the Contracting Officer, prior to construction.

#### SD-06 Test Records



Dust Control; G.

Method(s) of dust control.

Excavation/Trenching Clearance.

Prior to start of any excavation or trenching work, the Contractor shall obtain clearance, in writing, from the appropriate communications agency and base or area engineer. Copies of all correspondence shall be provided the Contracting Officer. Normal coordination time for obtaining the necessary permits is approximately fifteen (15) calendar days. The Contractor shall advise the Contracting Officer promptly when it appears that the normal coordination time will be exceeded.

Condition of Contractor's Operation or Storage Area.

The Contractor shall submit to the Contracting Officer photographs and/or videos depicting the condition of the Contractor's Operation or Storage Area.

SD-07 Certificate

Products Containing Recovered Materials.

The Contractor shall submit manufacturer's certification attesting that product meets or exceeds EPA's recovered material guidelines.

### 1.3 PROJECT MANAGEMENT ORGANIZATION

#### 1.3.1 General

The Contractor is responsible for ensuring that the contract is adequately staffed to manage all of the work in full accordance and compliance with the contract requirements.

#### 1.3.2 Organization Plan

The contractor shall submit an organization plan describing the organization it intends to structure for managing this contract. The plan shall include lines of authority, position responsibilities, and qualifications of the proposed staff. The project staff shall minimally consist of the following key personnel: Project Manager, Project Superintendent, Contractor Quality Control System Manager, Design Quality Control Manager, Safety and Health Manager. Each of the individuals selected to fill these positions is subject to acceptance by the Contracting Officer.

#### 1.3.3 Organizational Changes

The Contractor shall maintain the project management staff at full strength at all times. When it is necessary to make changes to the staff, the Contractor shall revise the Organization Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance at least fourteen (14) calendar days prior to implementation of the changes.

Substitutions for any accepted key personnel must be submitted for review and acceptance by the Contracting Officer prior to the start of work by that individual. The Contractor is informed that the Government will be allowed at least 30 days to respond. Any delays resulting from this process shall be the responsibility of the contractor and shall not be a basis for any equitable contract adjustment.

#### 1.3.4 Project Manager

The Project Manager shall be responsible for the contractor's overall management and coordination of this contract and shall be the central point of contact with the Government for performance of all work under this contract including warranty. The Project Manager shall oversee construction accomplishment, administer all instructions, and answer all questions from the Contracting Officer pertaining to the work during the life of the contract, including the warranty period. The Project Manager shall be responsible for the complete coordination of all work in this contract. The Project Manager will be responsible for ensuring that adequate internal controls and review procedures are followed in order to eliminate conflicts, errors and omissions, and for ensuring that all technical requirements are met. Another individual may be designated to temporarily act for the Project Manager, however, forty-eight (48) hours advance notice in writing of such change shall be requested to the Contracting Officer, and no change shall be made without prior acceptance by the Contracting Officer.

The Project Manager shall have a recognized four-year college degree in engineering, architecture, or related technical field, and at least five (5) years experience in managing and supervising Department of Defense construction projects of similar size and scope.

#### 1.3.5 Project Superintendent

A Project Superintendent shall be assigned. This individual shall have a minimum of five years experience as a superintendent on Department of Defense construction projects similar in size and scope to this contract. The project superintendent shall have overall responsibility for all operations on the jobsite. The superintendent shall be assigned no other duties.

#### 1.3.6 Contractor Quality Control

To assure compliance with contract requirements, the Contractor shall establish and maintain quality control for materials and work, including design, covered by all sections of the TECHNICAL REQUIREMENTS in accordance with Section 01451 CONTRACTOR QUALITY CONTROL. Records shall be maintained for all operations including sampling and testing.

#### 1.3.7 Safety

##### 1.3.7.1 General

Site activities performed in conjunction with this contract may pose safety hazards that require specialized expertise to effectively address and eliminate. The Contractor shall be responsible for preparing and

implementing an effective safety and health program throughout the entire duration of the contract.

#### 1.3.7.2 Accident Prevention Plan (APP)

The contractor shall prepare an Accident Prevention Plan in accordance with the provisions of FAR 52.236-13 (Section 00700) and Section 00800, paragraph S-36.18. The Accident Prevention Plan shall address the contractor's overall safety program for the entire contract. The APP shall consist of the forms and documents listed in Section 00800, S36.18, ACCIDENT PREVENTION PLAN, covering the overall safety considerations for the contract as a whole.

#### 1.3.7.3 Site-Specific Safety and Health Plan (SSHP)

The contractor shall prepare a site-specific safety and health plan addressing the safety aspects specific to the work ordered. Work on a feature of work shall not commence prior to receiving the Contracting Officer's written acceptance of both the contract Accident Prevention Plan and the site-specific safety and health plan.

The SSHP shall be prepared in accordance with the requirements specified in this section and shall comply with all federal, state, and local health and safety requirements, e.g., the Occupational Safety and Health Administration (OSHA) requirements (29 CFR 1910 and 1926) and the U.S. Army Corps of Engineers Safety and Health Requirements Manual (EM 385-1-1). The SSHP shall address those elements that are specific to the feature of work that have potential for negative effects on the safety and health of workers, the public, and other personnel on site.

An Activity Hazard Analysis (AHA), POD Form 184-R, rev 16 Oct 98, shall be submitted for all phases of construction specific to the feature of work and worksite. Work on a construction phase cannot begin until the AHA is submitted and accepted.

The SSHP shall identify the individual responsible for jobsite safety. This individual shall be present at the jobsite at all times during construction. Copies of the accepted SSHP and Accident Prevention Plan shall be available at the jobsite at all times. All workers shall know the location of these plans. All workers shall receive a safety briefing covering applicable sections of these plans prior to the start of construction.

Daily safety and health inspections shall be conducted to determine if site operations are conducted in accordance with the accepted SSHP and contract requirements. Results and observations made during these inspections shall be noted in the contractor's daily report.

#### 1.3.7.4 Safety and Health Manager

The Safety and Health Manager shall have direct responsibility for the overall management of the contractor's Safety Program for the entire contract, as required by the US Army Corps of Engineers Safety and Health Requirements Manual, EM385-1-1, and other applicable safety standards. This individual shall have a minimum of five (5) years experience in safety on Department of Defense construction projects similar in size and scope to this contract. All members of the safety staff are subject to review and acceptance by the Contracting Officer. The Safety and Health Manager shall

have no other duties.

#### 1.4 AS-BUILT DRAWINGS

As-built drawings shall be in accordance with Section 01780 CLOSEOUT SUBMITTALS.

#### 1.5 DUST CONTROL

Dust control measures shall be enforced throughout areas of demolition activity. A 15 foot high minimum dust/environmental screen barrier shall be provided where construction activity occurs adjacent to other activities and facilities. Dust barriers shall be equipped with posts and bracing to maintain the barrier in a plumb position. Barrier fabric shall be of sufficient strength to resist wear and tear for the duration of the construction activity. Dust barriers shall be approved by the Contracting Officer.

accordance with Section 02220 DEMOLITION.

#### 1.6 PROTECTION

The Contractor shall take all necessary precautions to insure that no damages to private or public property will result from his operations. Any such damages shall be repaired or property replaced by the Contractor in accordance with the CONTRACT CLAUSES entitled "PERMITS AND RESPONSIBILITIES" and "PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS", without delay, and at no cost to the Government.

##### 1.6.1 Warning Signs and Barricades

The Contractor shall be responsible for posting warning signs or erecting temporary barricades to provide for safe conduct of work and protection of property.

##### 1.6.2 Protection of Grassed and Landscaped Areas

The Contractor's vehicles shall be restricted to paved roadways and driveways. Vehicles shall not be driven or parked on grassed and/or landscaped areas except when absolutely necessary for the performance of the work and approved in advance by the Contracting Officer. Grassed or landscaped areas damaged by the Contractor shall be restored to their original condition without delay and at no cost to the Government.

##### 1.6.3 Protection of Trees and Plants

Where necessary, tree branches and plants interfering with the work may be temporarily tied back by the Contractor to permit accomplishment of the work in a convenient manner, so long as they will not be permanently damaged thereby. If this is not feasible, the Contracting Officer may prune them, subject to written approval.

##### 1.6.4 Protection of Building From the Weather

The interior of the building and all materials and equipment shall be protected from the weather at all times.

## 1.7 RESTORATION WORK

Existing conditions or areas damaged or disturbed by the Contractor's operations shall be restored to their original condition, or near original condition as possible, to the satisfaction of the Contracting Officer.

## 1.8 REMOVAL AND DISPOSAL

The Contractor shall salvage or recycle waste to the maximum extent practical as it relates to the capabilities of local industries. A record of the quantity of salvaged or recycled materials shall be maintained by the Contractor during the length of the project and submitted to the Contracting Officer at acceptance of the project. Quantities shall be recorded in the unit of measure of the industry. Reuse of materials on the site shall be considered a form of recycling. An example of such reuse would be the use of acceptable excavated materials as fill.

### 1.8.1 Title to Materials

Title to all materials and equipment to be removed, except as indicated or specified otherwise, is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after the Contractor's receipt of notice to proceed. Items indicated to be removed shall be removed and disposed of by the Contractor outside the limits of Government-controlled property at the Contractor's responsibility and expense before the completion and final acceptance of the work and such materials shall not be sold on the site.

### 1.8.2 Rubbish and Debris

Rubbish and debris shall be removed from Government-controlled property daily unless otherwise directed, so as not to allow accumulation inside or outside the building. Materials that cannot be removed daily shall be stored in areas designated by the Contracting Officer.

## 1.9 INTERFERENCE WITH GOVERNMENT OPERATIONS

The Contractor shall establish work procedures and methods to prevent interference with existing operations within or adjacent to the construction area. Free passage into adjoining or adjacent buildings not in the contract will not be permitted except as approved by the Contracting Officer. Procedures and methods shall also provide for safe conduct of work and protection of property that is to remain undisturbed.

### 1.9.1 Coordination

The Contractor shall coordinate all work with the Contracting Officer to minimize interruption and inconvenience to the occupants or to the Government. Scheduling and programming of work will be established during the pre-construction conference.

### 1.9.2 Materials and Equipment

All materials and equipment required to complete the project shall be on hand before work is started.

### 1.9.3 Utilities and Facilities

All utilities and facilities within the area shall remain operable and shall not be affected by the Contractor's work, unless otherwise approved in writing in advance by the Contracting Officer.

### 1.9.4 Staking and Flagging Existing Utilities

The Contractor, prior to start of any excavation or trenching work, shall verify the location of all utility lines shown on the drawings which are within the areas of work, and shall mark, stake, or flag each utility line along trench alignments and under areas of excavation under this project, as approved. Existing utility lines shall be located by walking trench alignments with approved equipment for locating underground pipes and cables. Utility lines so located shall be noted on the drawings.

### 1.10 CONTRACTOR'S OPERATIONS OR STORAGE AREA

The Contractor's operation and storage area is limited to areas within the limits of work.

### 1.11 CONTRACTOR PARKING

Parking for the Contractor's, his employee's, and subcontractors' personal vehicles is limited to areas within the limits of work. Personal vehicle parking is prohibited anywhere else within the boundaries of Schofield Barracks Military Base.

### 1.12 GOVERNMENT PROJECT OFFICE

The Contractor shall provide, for use by Government supervisory and inspection personnel, a job-site office space with a floor area not less than 500 square feet, with minimum twice-per-week janitorial service. This office space may be within the Contractor's project office building if adjacent to the job site and if separated by a solid partition; otherwise a separate facility, adjacent to the job site, shall be provided. The office shall be provided with windows and screens, air conditioning to maintain not more than 22 degrees C, electricity, wall outlets, ceiling lights, (1) telephone and (3) cellular phones or (4) cellular phones, (3) office desks with drawers, (3) layout tables, (5) ergonomic chairs, (4) legal-size five-drawer locking file cabinets, (3) 3-shelf bookcase, (3) plan racks, (1) fire extinguisher, and (3) computers.

Provide potable drinking water and temporary toilet facilities for Government personnel. Contractor's copier and fax machine shall be available for use by Government personnel. Contractor shall provide (4) vehicle parking spaces for Government personnel at the project office. The cost of utilities including two telephone lines with different telephone numbers (one number for the telephone instrument and one for the modem), air conditioning, and operation and maintenance costs of the Government project office shall be borne by the Contractor. The government will be responsible for its long distance calls. Upon completion of the project, the project office and furnishings shall be removed and disposed of by the Contractor.

#### 1.12.1 Computer Requirements

The Contractor shall provide computers for use by Government personnel assigned to this contract. These computers shall be Dell Optiplex GX260 or approved equal (proposed "equal" systems require approval by the Government prior to contract award), minimally configured as follows:

<b>Feature</b>	<b>Requirement</b>
OptiPlex GX260 Small Minitower	Pentium ® 4 Processor, 2.40GHz, 533FSB, 512K
Memory:	Cache, Intel Gigabit NIC, 1.0GB DDR Non-ECC SDRAM (2DIMMs)
Keyboards:	Dell PS/2 Keyboard in Gray, No Hot Keys
Monitors:	Dell 17 inch M782 flat CRT color monitor (16.0 viewable)
Video Boards:	32MB, ATI, Radeon™ 7500
Boot Hard Drives:	40GB EIDE 7200RPM
Card Reader:	5.25 inch PCMCIA Reader with Required PCI Controller Card
Floppy Drives:	Internal 1.44MB 3.5 Inch Floppy Drive
Operating System(s):	Windows® 2000 Professional, SP3 with CD using NTFS
Mouse.	Microsoft PS/2 2-Button IntelliMouse with Scroll
Network Adapters (NICs):	Integrated Intel Gigabit (10/100/1000) with Alert Standards Format
Modems:	Dell V.92 PCI Data/Fax Controllerless Modem for Windows
1 <sup>st</sup> Removable Media and DVD+RW Options:	48X CD-RW/DVD Combo, with Roxio Easy CD Creator™ and DVD Decode
Audio Solutions	Integrated Sound Blaster Compatible
Speakers:	Harman Kardon 206 Speakers
Documentation:	Resources CD contains Diagnostics and Driver for Dell OptiPlex Systems
Additional Hard Drive or ZIP Drive:	Zip 250 Disk Drive
Energy Star Label:	Energy Star Label
Hardware Support Services:	3Yr Same Day 4Hr Response Parts + Onsite Labor (M-F 8am-6pm)
Optional Support Services	Gold Technical Support, OptiPlex, 3 Years
Installation Support:	No Installation
Mouse Pad:	Mouse Pad
Power Protection:	Surgemaster Gold 9 outlet
Additional Software:	Microsoft Office 2000 Adobe Acrobat 5.0

The Contractor shall have delivered all required computer hardware and software directly to the Government Project Office in factory-sealed, unopened boxes. Any boxes delivered with damaged or tampered seals will be rejected by the Government and shall be replaced by the Contractor at no additional cost to the Government. The Government will perform set up of the computers in the Government Project Office.

The Contractor shall provide all software licenses and software updates for the duration of the contract. Hardware shall be provided with a 3-year manufacturer's onsite maintenance contract. Should the construction contract last longer than 3 years, at the end of the maintenance contract, the Contractor shall provide new computers, similar to the above, except

configured to the standard at that time. The Government will provide specifications for replacement workstations and hardware.

At the end of the construction contract, the Government will turn over all contractor-provided hardware and software to the Contractor. Hard drives will be wiped clean of all software, including the operating system.

#### 1.12.1.1 Other Devices (minimum requirements)

Printer: Hewlett-Packard Laserjet 5100TN or 5100DTN or approved equal (must be HP PCL compatible), Digital Camera: Kodak LS443 with additional 256 MB memory card, or approved equal.

#### 1.12.1.2 Connectivity Requirements

The Government Project Office shall be provided with one high speed internet connection (RoadRunner <sup>™</sup> or DSL) with a minimum download speed of 2 Mbps and a minimum upload speed of 384 kbps, **and a static IP address.**

#### 1.12.1.3 Networking Requirements

The Government Project Office shall be configured with a local area network that includes a hub with a minimum of five (5) ports. Wiring shall be CAT5 twisted pair cabling terminated with RJ-45 connectors, which will run from the cable-modem/hub to each of the workstations and/or other devices.

### 1.13 WORKING DIRECTIVES

#### 1.13.1 Working Hours

All work shall be performed between the hours of 0730 to 1600 HST, Monday through Friday. No work shall be accomplished on Saturdays, Sundays, and all federal holidays, without written permission from the Contracting Officer. Such written permission shall be available at the jobsite at all times during construction.

#### 1.13.2 Phasing

Buildings 356, 357, and 358 will be turned over to the Contractor no earlier than February 1, 2004, but no later than March 1, 2004. Building 355 will be turned over to the Contractor no earlier than February 1, 2005, but no later than March 1, 2005. The Contractor will only have limited access to all buildings prior to their turnover. Work in the buildings cannot start until the building is turned over to the Contractor. All utilities in the buildings shall remain fully operational until the building is turned over to the Contractor.

### 1.14 COMMERCIAL TELEPHONE SERVICE LINES

Availability of existing commercial telephone service lines are extremely limited and/or non-existent. Contractor shall coordinate with Verizon Hawaii to verify the extent of commercial telephone service lines available and what actions may be necessary to obtain said service in the magnitude required to satisfy its operational requirements. Notwithstanding the actual level of commercial telephone service lines available, the Contractor shall be responsible for all costs and necessary actions.



## 1.15 INSPECTION

### 1.15.1 Final Inspection and Acceptance

The Contractor shall give the Contracting Officer, a minimum of fourteen (14) calendar days advance notice prior to final inspection for acceptance by the Contracting Officer. The Contractor upon notification by the Contracting Officer shall promptly and satisfactorily correct all deficiencies found on final inspection.

## 1.16 USE OF PRODUCTS CONTAINING RECOVERED MATERIALS

Recovered materials are materials manufactured from waste material and byproducts that have been recycled or diverted from solid waste. The Contractor shall give preference to products containing recovered material when price, performance, and availability meet project requirements. A listing of products, including the recommended recovered material content, is provided by the Environmental Protection Agency at <http://www.epa.gov/cpg/products.htm>. Only those products having recovered material content equal to or greater than EPA guidelines shall be used to meet this requirement.

PART 2      PRODUCTS. (NOT APPLICABLE)

PART 3      EXECUTION (NOT APPLICABLE)